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UNITED STATES DEPARTMENT OF AGRICULTURE
BUREAU OF PLANT INDUSTRY
B. T. GALLOWAY, Chief of Bureau

REFERENCE BOOK
OF THE WORK OF THE
BUREAU OF PLANT INDUSTRY

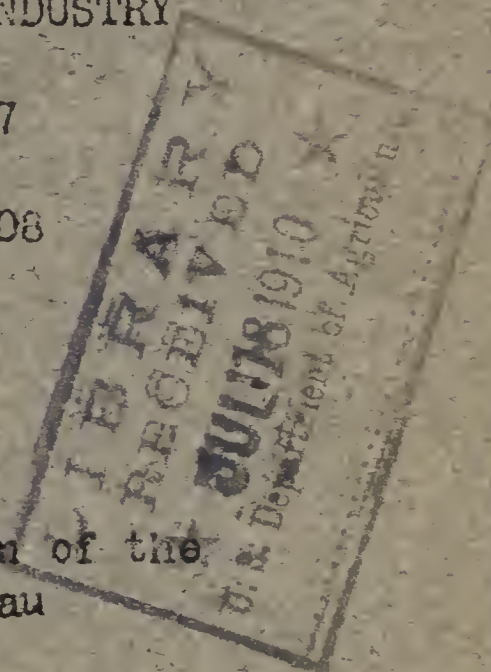
July 1, 1907
to
January 1, 1908

Prepared
Under the Direction of the
Chief of Bureau

By

WILLIAM L. MARCY

WASHINGTON
1907



Pathologist and Physiologist,

of Bureau --- BEVERLY T. GALLOWAY

Pathologist and Physiologist, an

Chief of Bureau --- ALBERT F. WOODS

PATHOLOGICAL INVESTIGATIONS	LABORATORY OF PLANT PATHOLOGY Erwin F. Smith, Pathologist in Charge	Identification of diseased specimens; study of bacterial diseases Investigations of diseases of cotton, truck crops, pecans, etc. Pathological collections, inspection of plants, greenhouses, etc.	Dr. Smith, assisted by J. O. Barton and Florence Hedger, W. A. Orton, Pathologist, W. W. Gilbert, Flora W. Patterson, Mycol, assisted by Vera K. Charl	AGREEMENT	General supervision of all investigations Farm management investigations in organized districts (Nos. 1 to 9) in various parts of the country	Prof. Spillman
	DISEASES OF FRUITS Merton B. Waite, Pathologist in Charge	Investigations of orchard diseases, eradication of pear blight, etc. Investigations of diseases of the grape, cranberry, etc. Spraying demonstrations in the control of orchard diseases	Mr. Waite, assisted by P. J. W. S. Ballard, C. L. Shear, Pathologist, George F. Miles and L. A. W. M. Scott, Pathologist, and James B. Rorer	Spillman, culturist Charge	Investigations of farm practice in relation to special phases of farming Range and cactus investigations Study of the application of business principles in farming	D. A. Fredie, in general charge; Harmon Benton, Lyman Carrier, M. A. Creeby, L. G. Dodge, Byron Hunter, H. A. Miller, and J. A. Warren, Assistant Agriculturists C. B. Smith, in general charge; F. G. Allison, J. S. Cates, J. S. Cotton, J. A. Drake, H. B. McClure, C. E. Quinn, and S. M. Tracy, Assistant Agriculturists David Griffiths, Assistant Agriculturist W. A. Peck, Assistant Agriculturist
	FOREST PATHOLOGY Heven Metcalf, Pathologist in Charge	Investigations of diseases of forest trees and woods, devising of remedial measures, etc.	Dr. Metcalf, assisted by Hedgcock and Perley Spe	ESTIGATIONS	Wheat investigations; improvement of cereals; rice investigations Investigations of dry-land cereals Investigations of grain sorghums Grain rust and smut investigations Study of wheat proteids Investigations of wheat nutrition Oat breeding Oat adaptation and introduction Grain investigations in Texas Grain experiments in California	Mr. Carleton, assisted by H. B. Derr, H. J. C. Umberger, and V. L. Cory W. M. Jardine, Agronomist C. R. Ball, Agronomist E. M. Freeman, Pathologist J. S. Chamberlain, Physiological Chemist, assisted by H. W. Houghton J. A. Le Clerc, Physiological Chemist J. B. Morton, Assistant Physiologist C. W. Warburton, Assistant Agronomist A. H. Leidigh, Assistant H. F. Blanchard, Assistant
PHYSIOLOGICAL INVESTIGATIONS	PLANT BREEDING A. D. Shamel, T. H. Kearney, and C. F. Hartley, Physiclogists in Charge	Cotton breeding Tobacco breeding Alkali and drought resistant plant breeding Corn breeding	Mr. Shamel, assisted by R. D. N. Shoemaker, D. A. Saun, Bain, E. B. Boykin, and H. Mr. Shamel, assisted by W. H. fite, W. W. Cobey, J. E. V. C. Brewer, and W. W. Mr. Kearney, assisted by L. Mr. Hartley, assisted by E.	Carleton, list in arge	General supervision of the work Devising of apparatus and methods Conduct of grain standardization laboratory at Baltimore, Md. Conduct of grain standardization laboratory at New Orleans, La. Inspection of American export grain arriving at European ports	Mr. Shanahan J. W. T. Duvel, Assistant L. A. Fitz, Assistant, and C. A. Neal Clyde E. Leighty, Expert, and W. P. Carroll E. G. Boerner, Special Agent
	PLANT LIFE HISTORY Walter T. Swingle, Physiologist in Charge	Investigations of the culture of the date palm, pistache nut, etc. Alfalfa and clover investigations Investigations of fig culture, tree crops for dry regions, etc.	Mr. Swingle C. J. Brand, Assistant Physiologist Silas C. Mason, Arboricult	NDARDIZATION Shanahan, bert in Charge	General supervision and improvement of the farm, tests of vegetables, flowers, fruits, etc. Investigations of the truck crop and peanut industries	Prof. Corbett, assisted by Earl C. Butterfield and W. V. Shear W. R. Beattie, Assistant Horticulturist
	SOIL BACTERIOLOGY AND WATER PURIFICATION Karl F. Kellerman, Physiologist in Charge	Investigations of nitrogen-fixing bacteria, soil bacteriology, etc. Copper treatment of water supplies and sewage disposal for eradication of bacterial pollutions	Mr. Kellerman, assisted by T. son, F. L. Goll, and R. P. Hib Mr. Kellerman, assisted by with	EXPERIMENTAL FARM Corbett, culturist harge	Study of diseases of the sugar beet, production of single-germ seed, extension of culture, etc. Investigations of sugar production Investigations of seed production	Dr. Townsend, assisted by E. C. Rittus and H. B. Shaw C. F. Saylor, Special Agent J. E. W. Tracy, Assistant, and J. F. Reed
	BIONOMIC INVESTIGATIONS OF TROPICAL AND SUBTROPICAL PLANTS O. F. Cook, Bionomist in Charge	Introduction and acclimatization of weevil-resistant cottons, corn for special conditions, etc.; investigations of tropical agriculture--culture of coffee, rubber, cacao, bananas, etc.	Mr. Cook, assisted by H. Pitt Collins, F. L. Lewton, and ler	INVESTIGATIONS ownsend, logist harge	Establishment of profitable agriculture on unproductive lands recently placed under irrigation Conduct of experimental farm at San Antonio, Texas	Mr. Scofield, assisted by W. A. Peterson Mr. Scofield, assisted by F. B. Headley
	DRUG PLANT, POISONOUS PLANT, AND TEA CULTURE INVESTIGATIONS Rodney H. True, Physiologist in Charge	General supervision of all investigations Production of morphine and other alkaloids from poppy capsules Investigations of camphor cultivation and utilization Denatured alcohol investigations Investigations of American hops Drug plant experimental cultivation Field investigations of loco weeds poisonous to animals Laboratory investigations of the poisonous action of loco weeds, mountain laurel, death camas, etc. Investigations of commercial tea production	Dr. True Dr. True, assisted by Frank Dr. True, assisted by S. C. Frank Ratak Dr. True W. W. Steckberger, Expert Dr. True, assisted by Alice G. F. Klugh, T. B. Young, S. C. F. W. Clarke C. Dwight Marsh, Expert A. C. Crawford, Pharmacology Dr. True, in cooperation with U. Shepard and assisted Mitchell and F. W. Clarks	RICUL- EXTENSION Scofield, culturist Charge	Investigations of agricultural problems in the Great Plains Area of the semiarid West; devising of crop rotations, cultural methods, etc.	Prof. Chilcott, assisted by C. A. Jensen and a corps of field agents
	PHYSICAL LABORATORY Lyman J. Briggs, Physicist in Charge	Physical and physiological determinations of the various factors governing plant growth, etc.	Dr. Briggs, assisted by J. O. Barton, J. W. McLane, and Julia R. Pearce	COLLECTIONS rackett, logist harge	Dissemination of information regarding the fruit industry, identification, description, and collection of fruit varieties, simplification of nomenclature, etc.	Mr. Brackett, assisted by W. N. Irwin and W. H. Ragan
	CROP TECHNOLOGY N. A. Cobb, Expert in Charge	Development of improved apparatus and methods for dry land agriculture, grain standardization, etc.	Dr. Cobb	STIGATIONS IN POMOLOGY Wm. A. Taylor and G. Harold Powell, Pomologists in Charge	Fruit marketing--experimental export shipments of fruits, etc. Fruit transportation and storage--prevention of decay in transit, study of farm fruit storage, etc. Viticulural investigations--experiments with imported phylloxera resistant grape stocks, etc. Fruit district investigations--adaptation of varieties, etc.	Mr. Taylor, associated with Mr. Powell and assisted by L. S. Tenny, G. W. Hosford, and H. M. White Mr. Powell, assisted by A. V. Stubenrauch, L. S. Tenny, S. J. Dennis, H. J. Eustace, G. W. Hosford, and H. M. White George C. Husmann, Pomologist, assisted by E. F. Cole and Alfred Tournier H. P. Gould, Assistant Pomologist, and W. F. Fletcher
	TAXONOMIC INVESTIGATIONS Frederick V. Coville, Botanist in Charge	General supervision of all investigations Preparation of a manual of the American grasses Compilation of notes of Dr. Edward Palmer on economic plants Economic collections Fiber plant investigations Classification of cottons	Mr. Coville A. S. Hitchcock, Systematic Agrostologist, assisted by P. L. Ricker W. E. Safford, Assistant Curator W. F. Wight, Assistant Botanist, C. F. Wheeler, and Ivar Tidestrom Lyeter H. Dewey, Botanist Fred J. Tyler, Assistant Botanist	EXPERIMENTAL GARDENS AND GROUNDS E. M. Byrnes, Superintendent	Care and ornamentation of Department grounds, maintenance of greenhouses, trial grounds, etc. Hybridization of plants, propagation of new and rare plants	Mr. Byrnes, assisted by a corps of gardeners George W. Oliver, Expert
	SUBTROPICAL LABORATORY AND GARDEN, MIAMI, FLA. Ernest A. Bessey, Pathologist in Charge	Breeding, propagation, and pathological studies of citrus and other subtropical trees and fruits, investigation of diseases caused by nematodes, testing of introduced seeds and plants, etc.	Dr. Bessey, assisted by George L. Fawcett	FOREIGN SEED AND PLANT INTRODUCTION David Fairchild, Agricultural Explorer in Charge	Direction of agricultural explorations; propagation and testing of introduced seeds and plants, etc. Agricultural explorations in China and Manchuria Introduction of pure races of brewing barleys Introduction of the matting rush industry	Mr. Fairchild, assisted by O. W. Barrett and Walter Fischer Frank N. Meyer, Agricultural Explorer Albert Mann and C. P. Norgord, Experts John H. Tull, Special Agent
	PLANT INTRODUCTION GARDEN, CHICO, CAL. August Mayer, Expert in Charge	Propagation and testing of introduced seeds and plants, forage crops, vegetable varieties, etc.; cooperative experiments with various offices of the Bureau, etc.	Mr. Mayer	FORAGE CROP TESTING AND EXTENSION C. V. Piper, Agrostologist in Charge	General testing of forage crops, propagation and distribution of seed of valuable varieties, etc. Alfalfa introduction and extension Testing and extension of new and standard grasses	Prof. Piper, assisted by H. T. Nielsen, A. E. Conner, Roland McKee, and M. M. Evane J. M. Westgate, Assistant Agrostologist, and Nicholas Schmitz R. A. Oakley, Assistant Agrostologist, and H. N. Vinall
	PLANT INTRODUCTION GARDEN, BROWNSVILLE, TEX. Edward C. Green, Pomologist in Charge	Propagation and testing of introduced seeds and plants believed to be especially suited to culture in South Texas; cooperative experiments with various offices of the Bureau, etc.	Prof. Green	VEGETABLE VARIETY TESTING GARDENS W. W. Tracy, Sr., Supt.	Testing of novelties introduced into the seed trade, standardization of varieties, etc.	Prof. Tracy, assisted by W. W. Tracy, Jr.
	COTTON CULTURE FARMS S. A. Knapp, Special Agent in Charge	Demonstration work in boll weevil districts of improved methods of cultivating the standard crops--cotton, corn, cowpeas--in order to obtain a satisfactory crop	Dr. Knapp, assisted by a corps of field agents; headquarters, Lake Charles, La.	CONGRESSIONAL SEED DISTRIBUTION (Directed by Chief of Bureau) SEED LABORATORY Edgar Brown, Botanist in Charge	Securing, packaging, and distributing on Congressional order, as provided by law, of various seeds and plants; also limited distribution of selected varieties of tobacco, cotton, and other seeds General seed testing, detection of adulteration; investigations of seed vitality, improved methods of handling various seeds, etc.	Mr. Brown, assisted by F. H. Hillman and W. L. Goss

AGRONOMIC INVESTIGATIONS

HORTICULTURAL INVESTIGATIONS

SEED AND PLANT INTRODUCTION INVESTIGATIONS

UNITED STATES DEPARTMENT OF AGRICULTURE
BUREAU OF PLANT INDUSTRY
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R E F E R E N C E B O O K
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REFERENCE BOOK
BUREAU OF PLANT INDUSTRY

SYNOPSIS OF THE WORK OF THE BUREAU

The Bureau of Plant Industry is authorized to expend for the fiscal year 1908 the sum of \$1,202,230. Of this amount \$189,450 is for statutory salaries, \$584,780 for the APPRO- general expenses, \$40,000 for grain PRIA- standardization, \$238,000 for the TIONS seed work, and \$150,000 for the work in meeting the ravages of the cotton boll weevil. The Bureau has 600 employees, 350 of whom are engaged in scientific work. The organization of the Bureau is such as to place direct responsibility on the men in charge of the various lines of investigation. All general administrative work is handled by the Chief of Bureau, aided by the Assistant Chief, the Chief Clerk, and the officer in charge of accounts and records, together with their respective VOLUME staffs. The Bureau handles in the OF course of the year about a quarter WORK of a million letters; issues about 4,500 requisitions, and audits 10,000 accounts. It prepares and issues bulletins and other publications embodying the results of its work, a total of 62 publications having been issued during the last fiscal year.

The principal officers and the organization of the Bureau are as follows:

Pathologist and Physiologist, and Chief of Bureau, Beverly T. Galloway.

Pathologist and Physiologist, and Assistant Chief of Bureau, Albert F. Woods.

Chief Clerk, James E. Jones.

Editor, J. E. Rockwell.

In Charge of Records, Leon M. Estabrook.

PATHOLOGICAL INVESTIGATIONS

Laboratory of Plant Pathology, Erwin F. Smith,
Pathologist in Charge.

Diseases of Fruits.--Merton B. Waite, Patholo-
gist in Charge.

Forest Pathology.--Haven Metcalf, Pathologist
in Charge.

PHYSIOLOGICAL INVESTIGATIONS

Plant Breeding:

Cotton Breeding) A. D. Shamel, Physiolo-
Tobacco Breeding) gist in Charge.

Breeding of Alkali and Drought Resistant
Crops.--T. H. Kearney, Physiologist in
Charge.

Corn Breeding.--C. P. Hartley, Physiologist
in Charge.

Plant Life History.--Walter T. Swingle, Physi-
ologist in Charge.

Soil Bacteriology and Water Purification. --
Karl F. Kellerman, Physiologist in Charge.

Bionomic Investigations of Tropical and Sub-
tropical Plants.--O. F. Cook, Bionomist in
Charge.

Drug Plant, Poisonous Plant, and Tea Culture
Investigations.--Rodney H. True, Physiologist
in Charge.

Physical Laboratory.--Lyman J. Briggs, Physi-
cist in Charge.

Crop Technology.--N. A. Cobb, Expert in Charge.

TAXONOMIC INVESTIGATIONS

Frederick V. Coville, Botanist in Charge.

AGRONOMIC INVESTIGATIONS

Farm Management.--W. J. Spillman, Agricultur-
ist in Charge.

Grain Investigations.--M. A. Carleton, Cereal-
ist in Charge.

Grain Standardization.--John D. Shanahan, Expert in Charge.

Arlington Experimental Farm.--L. C. Corbett, Horticulturist in Charge.

Sugar Beet Investigations.--C. O. Townsend, Pathologist in Charge.

Western Agricultural Extension.--Carl S. Scofield, Agriculturist in Charge.

Dry Land Agriculture.--E. C. Chilcott, Agriculturist in Charge.

HORTICULTURAL INVESTIGATIONS

Pomological Collections.--G. B. Brackett, Pomologist in Charge.

Field Investigations in Pomology.--Wm. A. Taylor and G. Harold Powell, Pomologists in Charge.

Experimental Gardens and Grounds.--E.M.Byrnes, Superintendent.

SEED AND PLANT INTRODUCTION INVESTIGATIONS

Foreign Seed and Plant Introduction.--David Fairchild, Agricultural Explorer in Charge.

Forage Crop Testing and Extension.--C.V.Piper, Agrostologist in Charge.

Vegetable Variety Testing Gardens.--W.W.Tracy, Sr., Superintendent.

Congressional Seed Distribution.--Under immediate direction of Chief of Bureau.

Seed Laboratory.--Edgar Brown, Botanist in Charge.

SPECIAL LABORATORIES, GARDENS, AND FARMS

Subtropical Laboratory and Garden, Miami, Fla.--Ernst A. Bessey, Pathologist in Charge.

Plant Introduction Garden, Chico, Cal.--August Mayer, Expert in Charge.

Plant Introduction Garden, Brownsville, Tex.--Edward C. Green, Pomologist in Charge.

Cotton Culture Farms.--S. A. Knapp, Special Agent in Charge, Lake Charles, La.

As shown in this pamphlet, the Bureau is actively cooperating in many lines of work with the agricultural experiment stations of nearly every State and Territory.

COÖPER- ATIVE WORK It is encouraging school garden work by cooperation with schools in all parts of the country and the distribution of seeds and plants, about 75,000 school gardens having been aided in this way during the past year. The Bureau is conducting special work on cotton in the boll weevil districts by cooperative demonstration work with farmers, of whom 100,000 took part last year; by breeding new types of cotton; establishing diversification **SPECIAL** farms and improving systems of farm **WORK ON** management; studying cotton diseases **COTTON** and suggesting remedies therefor; and introducing from foreign countries new cottons and other crops which give promise of value. In accordance with recent legislation the Bureau is conducting work in the standardization of grain entering into interstate and foreign commerce, **GRAIN** establishing laboratories at the principal grain centers for this purpose. **STAND- ARDI- ZATION** It examines cargoes of American export grain arriving at foreign ports in order to ascertain their actual condition on arrival, about 125,000 tons of grain having been so inspected during the past year.

The Pathological Investigations of the Bureau cover diseases of cereal, forage, and truck crops, cotton, tobacco, sugar beets, fruits and fruit trees, forest trees, subtropical plants, and **PLANT** also the diseases caused by nematodes, or root worms. **DIS- EASES** The work on cotton diseases is carried on with special reference to the boll weevil problem, the

breeding of varieties resistant to wilt, root-rot, and other diseases encountered in boll weevil sections, as well as the working out of remedies for these diseases, being under way. The pathological work on truck crops includes the various diseases affecting potatoes, cucumbers, melons, lettuce, spinach, and other vegetables, the breeding of resistant varieties and the discovery of remedies being sought. The work on fruit diseases covers particularly orchard fruits. Diseases of small fruits, such as cranberries and grapes, are also being investigated. The orchard diseases receiving attention are pear blight, "little peach," bitter rot of the apple, brown rot of peaches and other stone fruits, the crown gall diseases of various fruits, etc. Spraying and other methods for the control of these diseases are being demonstrated in infected areas in various States. The work on diseases of tobacco and the sugar beet is conducted in connection with other investigations of these crops, the development of resistant strains, as well as remedial measures, being the objects sought. The work on cereal rusts and smuts is carried on as a part of the Grain Investigations of the Bureau; and diseases of rice, particularly the "blast" infecting the rice fields of South Carolina, are under investigation. The breeding of disease resistant oat varieties is also a feature of the pathological work on cereals. The work on diseases of forage plants covers such crops as cowpeas, clover, and alfalfa, the breeding of wilt resistant cowpeas being a special feature. Diseases of forest trees are being investigated, special attention being given to those affecting the red gum, coniferous trees and timber, oaks and other hard woods, etc. Preventive measures for these diseases are being

worked out and their applicability to the timber industry demonstrated. A method of treating fence posts to prevent decay is also being demonstrated. Diseases of subtropical fruits and other plants, as well as the diseases caused by nematodes, are being studied at the Subtropical Laboratory and Garden, Miami, Fla., the former line of investigation covering citrus fruits, the mango, avocado, etc. Work on pecan diseases, to control scab, etc., by means of spraying, is being conducted. A comprehensive pathological survey of the United States proper, as well as of Hawaii, is a feature of the Bureau's work on plant diseases.

The Plant Breeding Investigations of the Bureau include the improvement, by hybridization and selection, of cotton, corn, wheat, oats, tobacco, citrus fruits, pineapples, and other subtropical fruits, forage and truck crops, and the development by BREEDING the same means of strains of field crops which will be more resistant to alkali and drought than those now cultivated. The cotton breeding work has for its main objects the development of early varieties for boll weevil districts, long staple races, and pedigree strains of short staple varieties, and also the introduction of Egyptian cottons. The corn breeding work covers both field corn and sweet corn, the production of greater yielding varieties and, in the case of sweet corn, of strains better suited for canning, being sought. The breeding and other work on tobacco includes the testing of promising new hybrids of Connecticut wrapper tobaccos, the improvement of wrapper and filler tobaccos in the South and of Maryland smoking tobaccos, experiments in improving methods of curing, testing the burn, etc., the securing of suitable cover crops to grow with tobacco,

and, as stated previously, the study of tobacco diseases, including the breeding of disease resistant varieties. The wheat breeding work is conducted as a part of the Grain Investigations of the Bureau, the development of improved varieties for regions where they are needed being the object sought. The work on oat breeding includes the testing of new hybrids, selection experiments with winter and spring oats, and also selections for disease resistance. The citrus breeding work has for its object the development by hybridization of new sorts superior to the existing varieties, the promising new fruits called the tangelo and the citrange having been produced. The breeding work on pineapples is for the purpose of obtaining new smooth or spineless leaved varieties superior to those now in use. The breeding of subtropical fruits such as the mango, avocado, and sapodillo is conducted mainly at the Subtropical Laboratory and Garden, the improvement of these fruits being the object. The forage crop breeding work includes alfalfa, clover, sorghum, vetches, edible forms of cacti, etc., being mainly carried on in connection with other lines of forage crop investigations; and that on truck crops covers potatoes, lettuce, celery, etc. The work of breeding crops which will be resistant to alkali and drought covers a wide diversity of field crops, such as sugar beets, cotton, alfalfa, and miscellaneous grain and forage crops, including grasses.

The Bureau conducts Plant Life History Investigations of the date palm, pistache nut, fig, clover and alfalfa, and other crops, with the object of obtaining PLANT further knowledge of the culture of LIFE these crops which can be applied in HISTORY practice. The introduction of date culture into the United States is a prominent feature

of this work. Similar work is being conducted with the pistache, both wild and cultivated forms of this nut being under investigation. The life history of figs and caprifigs is being studied; and crops suited for cultivation in dry regions are being investigated. The work on alfalfa and clover includes the testing of newly discovered varieties and their introduction into general cultivation.

Work on soil bacteriology is being conducted by the Bureau, consisting of field experiments with nodule-forming bacteria and the distribution of cultures of these beneficial bacteria for use in inoculating leguminous crops. Their applicability to crops other than legumes is being investigated; and the value of commercial cultures is ascertained with a view to protecting farmers from fraud. Work on water purification is being carried on to demonstrate the value of copper and other agencies in eradicating algal and other bacterial pollutions in water supplies, sewage disposal, etc. The Bureau is engaged in biologic investigations of tropical and subtropical plants such as coffee, rubber, cacao, Indian corn, etc. This work also includes the study of weevil resisting Central American varieties of cotton with a view to their acclimatization in the United States. Work in the propagation and improvement of tropical and subtropical plants is being carried on at the Subtropical Laboratory and Garden, including experiments with the vanilla bean, sugar apple, mango, etc.

The Bureau is conducting Drug Plant Investigations, including the testing of foreign and domestic varieties of both wild and cultivated drug-producing plants; an investigation of the practicability of obtaining morphine

and other alkaloids from the capsules of the Asiatic poppy on a commercial scale; the study of camphor utilization and production in the United States, with a view to the development of a domestic source of DRUG PLANTS - supply for this product; investigations of the growing, curing, and handling of American hops, with a view to the improvement of methods and the consequent elimination of the existing discrimination in foreign markets against the American product; and various other problems. Poisonous Plant Investigations are being conducted, including chiefly the study of the POIS- so-called loco disease in horses, ONOUS cattle, and sheep, with a view to PLANTS preventing the disease by the eradication of the weeds causing it and the development of methods of control. Work on other plants poisonous to stock, such as the mountain laurel, mistletoe, death camas, and larkspur, is also under way, antidotes and preventives being sought. Tea Culture Investigations are being conducted by the Bureau to ascertain the practicability of growing AMERI- ing and manufacturing tea on a profitable CAN itable commercial scale in the TEA United States and to work out the improvement of processes and product. About 15,000 pounds of dry tea of good quality were produced in South Carolina during the past year; and the development of a compressed tea tablet is also a feature of this work.

The Bureau maintains a Physical Laboratory for the purpose of determining, in connection with the various lines of work, the physical and physiological factors PLANT which govern plant development. The PHYSICS influence of electricity on plant growth is a feature of these studies, the principal object being to prevent the fraud-

ulent exploitation of apparatus claimed to be of benefit in practical farming. The Taxonomic Investigations of the Bureau include the preparation of a manual of the American grasses and of the flora of Alaska; TAXO- a study of the plants used by the NOMIC aborigines; the maintenance of an WORK authentic collection of cultivated economic plants, as an aid to accurate description and identification; and other features. Work on fiber plants is being carried on to encourage and improve the culture of such crops as hemp, flax, sisal, and ramie. The increased production of hard fiber in this country and its insular possessions is the principal object, special attention being given to hemp and flax.

The Bureau conducts Farm Management Investigations through the establishment of farm management districts throughout the country, especially in the cotton belt. In these districts object-lesson farms are conducted for the purpose of stimulating interest in the diversification of crops, improved methods of farm management, etc. In the boll weevil districts the desirability of a wider diversification is demonstrated. The work also includes the diversification of crops on rice lands; methods of storing FARM silage; soiling systems, including MANAGE- methods of maintaining fertility and MENT the relation of types of farming thereto; forage crops for hogs, beef cattle, etc.; farm practice in potato culture, legume growing, etc.; the extermination of Johnson grass; hay investigations; winter cover crops for the South, as well as crops for the Gulf Coast region; and other miscellaneous farm problems. Investigations of range management and of the value of forms of the cactus plant,

especially that known as the prickly pear, as food for stock are also being conducted.

The Bureau is conducting Grain Investigations, including the extension of the area of winter wheat and other winter grains; adaptation work with rye, barley, wheat, CEREAL winter oats, etc.; further tests of CROPS durum wheat, an industry established by the Department of Agriculture; the improvement of wheat in California; an investigation of wheat deterioration and of the milling and feeding value of introduced grains; investigations of grain sorghums and of rice varieties; the study of the rusts and smuts affecting cereal crops; and the conducting of an experimental farm in the Panhandle region of Texas, for the testing of grain and other crops adapted to that locality. Work on forage crops is being conducted by the Bureau in the extension of the cultivation of standard varieties and the introduction and adaptation of new and improved varieties. Among the latter are the Turkestan and Arabian alfalfas, and also a new Siberian alfalfa, recently discovered and imported. Varieties of sorghum, grasses, and leguminous soil-improving crops are being tested. Experiments with fertilizers are being conducted, and cooperative work in the use of nitrogen-fixing bacteria is being carried on.

On the Arlington estate in Virginia the Bureau maintains, as authorized by law, an experimental farm where excellent facilities for its work, as well as that of many ARLINGTON other Bureaus of the Department, are afforded. The work of the Bureau on the Farm includes tests of Irish potatoes, sweet potatoes, and other vegetables; the growing of vegetables and flowers under shade; etc. Investigations of

the Bermuda onion and other truck crop industries are being conducted in connection with the Farm, a comprehensive truck crop survey being a feature. On the Farm, as well as at other points, the Bureau carries on tests of new varieties of vegetables introduced into the seed trade. In the greenhouses of the Department, which are maintained under the supervision of the Bureau, experiments are being conducted in the growing of tomatoes under glass; the improvement of lettuce, celery, and other vegetables; BLEED AND and the hybridization of carnations, FLOWERS chrysanthemums, dahlias, roses, and other flowering plants. Experiments in the growing of Bermuda lilies from seed, as well as in the growing of tulip, hyacinth, and other Dutch bulbs now imported, are being carried on. The propagation of ornamental trees, shrubs, etc., for planting in the Department grounds is a feature of the greenhouse work of the Bureau.

The Bureau conducts Sugar Beet Investigations to develop single-germ seed; to improve cultural methods; to determine the best fertilizers for sugar beets, as well as the best methods of siloing seed beets; to extend the area of sugar beet culture; and to prevent the diseases of the sugar
SUGAR BEETS beet, especially those known as curly top and leaf-eyes. Investigations are also being carried on in the development of high-grade strains of home-grown sugar beet seed; and strains of beets which will withstand alkali and drought are being bred, as previously mentioned in the work on plant breeding. Investigations of the agricultural possibilities of the newly irrigated regions of the semiarid West, as well as of methods of dry land agriculture for the Great

Plains Area, are being conducted by the Bureau. Crop rotations and methods of soil preparation are being worked out, and drought-resistant crops suited DRY to these regions are being devel- FARMING oped, including tree crops, cereals, forage crops, etc. Twenty stations have been established throughout the territory mentioned on which the various problems encountered in farming under dry conditions are being studied.

The Bureau carries on fruit investigations, which may be classified under four main headings, viz: Fruit Marketing; Fruit Transportation and Storage; Grape Investigations; and Fruit District Investigations. Mention has been made previously of the Bureau's work on fruit diseases, which will not be repeated here. The work on fruit marketing includes

experimental export shipments of ap- WORK ON ples, peaches, pears, etc., to de- FRUITS velop an export trade in these fruits. The transportation and storage investigations include the transcontinental shipment of peaches, plums, and citrus fruits to determine their keeping qualities and to devise methods of preventing decay in transit and in storage. The farm storage house problem is also being investigated. The work on grapes consists of the maintenance of experimental vineyards in California for developing improved cultural methods and for the testing of newly imported phylloxera-resistant vine stocks. An investigation of the Rotundifolia type of grape, commonly known as the Scuppernong, is being conducted. The fruit district investigations are directed toward determining the adaptability of fruit varieties to different sections. An investigation of pecan varieties and of the adaptability of peach varieties is also a feature of the fruit investigations of the Bureau.

The Bureau conducts work on the introduction from foreign countries of rare and valuable seeds and plants for propagation and testing in various parts of the United States. Agricultural explorers are sent to different parts of the world in search of promising varieties of seeds and NEW plants. Among the valuable new in- INDUSTRIES so introduced may be mentioned TRIES durum wheat, the date palm, the pistache, disease-resistant varieties of rice, etc. In connection with this work the Bureau maintains plant introduction gardens at Chico, Cal., and at Brownsville, Tex., where introduced seeds and plants believed to be suited for those localities are placed for trial. Among the plants now under experiment in this way are the pistache, figs and capri-figs, Japanese matting rushes, edible species of the cactus, phylloxera-resistant grapes, and also forage crops and vegetables. Scions of these varieties are distributed to co-operators throughout the country for testing. Additional features of the seed and plant introduction work of the Bureau are investigations having for their object the introduction of pure races of brewing barleys and also the work of developing a domestic source of supply for the raw material used in the matting industry.

The Bureau maintains a Seed Laboratory for the purpose of examining samples of commercial seeds for the presence of adulterants, publishing, in accordance with law, the results of such examinations; the PERE SEED testing of samples of imported seed to ascertain its quality; and the miscellaneous testing of samples of seed submitted by farmers and others. Investigations of the vitality of seeds are also being conducted by the Seed Laboratory.

The Congressional distribution of seeds and plants devolves upon the Bureau of Plant Industry, and entails annually the packeting, assembling, and mailing of about 35,000,000 packets of vegetable and flower seeds, and the sending out of various other kinds of seeds and plants. In connection with this work the Bureau maintains SEED DISTRIBUTIONAL grounds for the testing of the seeds secured for distribution. In addition to the regular distribution, a limited quantity of seed of select varieties of cotton, tobacco, and forage crops is sent to farmers in regions where improved varieties are most greatly needed.

As has been intimated through this synopsis, the Bureau maintains in various parts of the country special laboratories, gardens, or farms for the testing and propagation of varieties of plants believed to be especially suited to the local conditions. Of these stations have already been mentioned the Arlington (Va.) Experimental Farm near Washington; the Subtropical Laboratory and Garden, at Miami, Fla.; the plant introduction gardens at Chico, Cal., and at Brownsville, Tex.; and the experimental farm in the Panhandle region of Texas, which is located at Amarillo.

FIELD STATIONS In addition to these the Bureau maintains, in its special demonstration work on cotton in the boll weevil districts, field headquarters at Lake Charles, La.; and in the work of breeding new cottons a laboratory and experiment farm are located at Waco, Tex. An experimental farm is also located at San Antonio, in connection with the Bureau's work on cotton and other crops. Under the heading of field stations may also be included the grain standardization laboratories of the Bureau at Baltimore, New Orleans; and other grain centers.

The lines of investigation referred to in the preceding pages are conducted by the investigators whose names appear in the following list.

ALPHABETICAL LIST OF INVESTIGATORS

Description, Location, and Cost
of Their Work

ALLARD, H. A. Assistant in cotton breeding.
See Shamel.

ALLISON, F. G. Assistant, Farm Management Investigations. Studies farm practice in relation to maintaining soil fertility.
See Smith, C. B.

BAIN, S. M. Special agent in cotton breeding, Tennessee, Arkansas, and Texas. See Shamel.

BALL, CARLETON R. Agronomist, Grain Investigations. Engaged in investigations of grain sorghums. Work is being conducted chiefly in Texas, Kansas, and California, in cooperation with the State experiment stations. Much attention is given to a comparative study of varieties, including many introduced sorts, and adaptation experiments with the best of these for a comparison of yields and a determination of the kinds that are best suited to particular localities. The object of the work is to establish the most hardy, especially the most drought-resistant, grain sorghums in the semiarid regions of the Southwest, even in places where almost all other crops fail because of the drought. Complete and thorough notes are taken on the various qualities of the different sorghums,

Ball, Carleton R.--Continued.

particularly drought resistance, early maturity, and yield, with the object of securing an average of these characteristics for three or more years which will give information that can be depended upon in the selection of suitable varieties. Expenses this year, about \$2,600, of which \$2,200 is for salaries and \$400 for traveling and other miscellaneous expenses.

BALLARD, W. S. Assistant, Investigations of Diseases of Fruits. See Waite.

BARRETT, O. W. Assistant, Foreign Seed and Plant Introduction. See Fairchild.

BEATTIE, W. R. Assistant horticulturist, Arlington Experimental Farm. Engaged in truck crop investigations along the Atlantic coast and in adjacent States, and investigations of the peanut industry. Work with truck crops is being conducted throughout the Eastern States, especially those bordering the south Atlantic coast. It is mainly in the form of demonstrations in cooperation with growers, and on experimental plots at Tea and Gough, S. C. The objects are the adaptation of truck crops to the rice lands of the south Atlantic coast, the general improvement of cultural methods, and the dissemination of desirable varieties. A study of market conditions is being made, for the improvement of methods of packing, handling, and shipping. The work with peanuts is being conducted in Virginia, North Carolina, South Carolina, Georgia, Texas, and at points throughout the Western States. The main part of the work is carried on at Suffolk, Va. The objects are the improvement of varieties by seed selection; improvement

Beattie, W. R.--Continued.

of cultural methods, including trials of fertilizers and crop rotation; demonstrations of the uses of peanuts as stock food; and a study of the harvesting, marketing, and uses of peanuts. Expenses this year in these lines of work, about \$4,000, of which \$2,500 is for salaries and \$1,500 for traveling and other miscellaneous expenses.

BECKWITH, T. D. Assistant in water purification. See Kellerman.

BELZ, J. O. Assistant, Physical Laboratory. See Briggs.

BENNETT, R. L. Special agent in cotton breeding in Texas. See Shamel.

BENTON, HARMON. Assistant agriculturist, Farm Management Investigations, District No. 1, including North Carolina, South Carolina, Georgia, and Florida. See Brodie.

BESSEY, ERNST A. Pathologist in charge of Subtropical Laboratory and Garden, Miami, Fla. Work is being conducted in the Gulf States, South Carolina, California, and Porto Rico, in cooperation with individuals and to some extent with the Florida experiment station. The investigations cover diseases of citrus and other subtropical trees and fruits, with the object of ascertaining the best and most prompt curative treatments; diseases of truck crops, for the purpose of controlling them and breeding disease-resistant varieties; the improvement of subtropical fruits, grapes, etc., with a view to the development of superior varieties ripening over as long a period as possible; and a study of the life history of the various

Bessey, Ernst A.--Continued.

species of nematodes injurious to economic plants, with the object of determining the best method of combating them. Expenses this year in these lines of work, about \$9,000, of which \$4,500 is for salaries and \$4,500 for traveling and other miscellaneous expenses. Dr. Bessey is assisted by Mr. George L. Fawcett.

BLANCHARD, H. F. Assistant, Grain Investigations. Engaged in grain experiments in California. Work is being conducted at Modesto and at Yuba City, in cooperation with the California experiment station, consisting of adaptive trials of many varieties of wheat, trials of legumes in rotation with wheat, and tests of different methods of cultivation and harvesting. The object of the work is to establish higher proteid wheats in California and to determine means of preserving the proteid content. Some breeding work is also being carried on. Chemical analyses are made to show the results of these experiments on the quality of the grain; and complete notes are recorded. Expenses this year, about \$1,800, of which \$1,700 is for salaries and \$100 for traveling and other miscellaneous expenses.

BOERNER, E. G. Special agent, Grain Standardization. Engaged in the inspection of cargoes of American export grain arriving at European ports. Work is being conducted at the principal grain-receiving ports of Great Britain and Continental Europe, having for its object the securing, in accordance with recent legislation, of definite information regarding the condition on arrival of American grain shipped from the various Atlantic and Gulf ports of the United States. Much

Boerner, E. G.--Continued.

of the complaint of foreign buyers is based on damaged grain, and it is the aim to eliminate this feature of our export trade by studying and improving the conditions of handling the grain at the ports of shipment and also in transit. Much valuable information has been obtained thus far which will greatly aid the work on grain standardization. Expenses this year, about \$2,500, including salary and the necessary traveling and other miscellaneous expenses.

BOYKIN, E. B. Special agent in cotton breeding. See Shamel.

BRACKETT, G. B. Pomologist in charge of Pomological Collections. Work is conducted entirely at Washington, having for its objects the collection and dissemination of information concerning fruit varieties, the simplification of fruit nomenclature, and the identification and description of varieties, in connection with which work models and paintings of fruits are made and preserved. Expenses this year, about \$7,500, of which \$6,500 is for salaries and \$1,000 for supplies and other miscellaneous expenses. Mr. Brackett is assisted by Messrs. W. N. Irwin and W. H. Ragan.

BRAND, CHARLES J. Assistant physiologist, Plant Life History Investigations. Engaged in life history investigations of alfalfa and clover. Alfalfa investigations are being conducted in cooperation with the experiment stations and farmers in California, Utah, Arizona, Oregon, Montana, Michigan, Nebraska, North Dakota, South Dakota, Texas, New York, Vermont, Maryland, Kentucky, and in the provinces of Ontario and Saskatchewan,

Brand, Charles J.--Continued.

Canada. Clover experiments are being carried on in several of the States of the clover belt, viz: Indiana, Minnesota, Ohio, and Tennessee; and a number outside of it, including among the latter Oregon, Washington, Montana, North Dakota, South Dakota, Nebraska, Utah, and Florida. Cooperation in this work is practiced with the experiment stations of Minnesota, Utah, Tennessee, and Florida. The work has for its objects the investigation of the life history of alfalfa and red clover, with special reference to their heat, moisture, aeration, nutrition, pollination, and cultural requirements, with a view to discovering drought-resistant varieties for the semiarid portions of the West and hardy varieties for the colder sections of the United States; and also to determine the effect of change of seed, the regions where seed production can be carried on most profitably, and from what sources farmers in various States can secure seed most likely to succeed under their conditions. Expenses this year, about \$6,000, of which \$2,500 is for salaries and \$3,500 for traveling and other miscellaneous expenses.

BREWER, V. C. Expert in tobacco investigations. See Shamel.

BRIGGS, LYMAN J. Physicist in charge of Physical Laboratory. Work consists of physical investigations connected with various lines of work of the Bureau. Field work is being carried on in North Dakota, South Dakota, Nebraska, Kansas, and Texas in connection with the Great Plains cooperative dry land agriculture experiments conducted by Prof. E. C. Chilcott (described later). The object of the Laboratory is to devise

Briggs, Lyman J.--Continued.

methods for the quantitative measurement of the physical and physiological factors which modify crop production, in order to determine the relations between environment and plant growth, and the effects produced by different crop rotations and systems of cultivation. Expenses this year, about \$13,500, of which \$8,000 is for salaries and \$5,500 for traveling and other miscellaneous expenses. Dr. Briggs is assisted by Messrs. J. O. Belz and J. W. McLane and Miss J. R. Pearce.

BRODIE, D. A. Assistant agriculturist, Farm Management Investigations. In general charge of work in farm management districts, of which nine have been organized, each district including one or more States. This work consists in a study of the types of farming prevailing in each district and the general results secured from each type; the cropping systems used on farms of different types; and the adaptability of different types of farming to the particular region. Attention is also given to local conditions with reference to the amount, kind, and character of available farm labor and to market conditions; to the adaptability of crops to local conditions of soil and climate; to methods of crop and stock management; to the equipment used on farms of various types, including a study of the machinery, live stock, buildings, fences, and other requirements for successful work. Attention is also devoted to local methods of tillage; and a detailed study of the system of management in vogue on successful farms is a leading feature of the work. A part of the work also consists in conducting object-lesson farms and demonstrations on special

Brodie, D. A.--Continued.

phases of farming in cooperation with State authorities. In the cotton States, where four of the nine districts are located, the work has a special bearing on the boll weevil problem, the advisability of the diversification of crops being demonstrated to cotton growers. Expenses this year in these lines of work, about \$35,000, of which \$13,000 is for salaries and \$12,000 for traveling and other miscellaneous expenses. The work in these districts is personally conducted by Messrs. Harmon Benton, Lyman Carrier, M. A. Crosby, L. G. Dodge, Byron Hunter, C. K. McClelland, H. A. Miller, and J. A. Warren, the States covered by each being mentioned opposite their names elsewhere in these pages. The work in District No. 4, which covers Texas, is at present under the personal supervision of Mr. Brodie.

BROWN, EDGAR. Botanist in charge of Seed Laboratory. Work covers the examination of seeds for the presence of adulterants, in accordance with law; making tests of seeds for farmers and others in regard to germination and mechanical purity; and the preparation and distribution of authentic sets of seeds of weeds and economic plants. Seed testing methods are being worked out, and investigations of the vitality of seeds are being carried on, with special reference to the harvesting, curing, and storing of seed corn. Expenses this year, about \$20,000, of which \$13,000 is for salaries and \$7,000 for traveling and other miscellaneous expenses. Mr. Brown is assisted by Messrs. F. H. Hillman and W. L. Goss.

BROWN, ERNEST B. Assistant in corn breeding. See Hartley.

BUTTERFIELD, EARL C. Assistant horticulturist, Arlington Experimental Farm. See Corbett.

BYRNES, E. M. Superintendent, Experimental Gardens and Grounds. Work includes the care and ornamentation of the Department grounds, maintenance of greenhouses and trial grounds for experimental purposes, and the propagation of plants for Congressional and special distribution. Facilities for horticultural work are provided for the various offices of the Bureau, a complete range of greenhouses being maintained. Expenses this year, including care of Department grounds, about \$40,000, of which \$30,000 is for salaries of gardeners, mechanics, etc., and \$10,000 for the miscellaneous expenses of maintenance.

CARLETON, M. A. Cerealist in charge of Grain Investigations. Work in the establishment of durum wheat is being conducted in the semiarid West in cooperation with the State experiment stations in the Great Plains Area, and also in portions of California, Washington, Montana, and other Rocky Mountain States; in the improvement of wheat in California, in cooperation with the State experiment station; the improvement of winter grains for the South, chiefly in Tennessee, but also in Texas, Georgia, and North Carolina; the improvement of oats, mainly in Wisconsin, North Dakota, South Dakota, Kansas, and Nebraska, in close cooperation with the experiment stations in those States; the improvement of barley, in cooperation with the experiment stations of Wyoming, North Dakota, South Dakota, Wisconsin, Minnesota, Montana, and States of the Middle West; and investigations of the rice industry in

Carleton, M. A.--Continued.

Louisiana, in cooperation with the State experiment station, the object being to introduce better yielding varieties and to improve cultural methods. Cooperation in various lines of work is practiced with the Maryland experiment station. Expenses this year in the work described, about \$18,000, of which \$15,000 is for salaries and \$3,000 for traveling and other miscellaneous expenses. Mr. Carleton is assisted by Messrs. H. B. Derr, H. J. C. Umberger, and V. L. Cory. The investigations of Messrs. Ball, Blanchard, Chamberlain, Freeman, Jardine, Le Clerc, Leidigh, Norton, and Warburton, described elsewhere in these pages, are directed by Mr. Carleton.

CARRIER, LYMAN. Assistant agriculturist, Farm Management Investigations, District No. 9, including Pennsylvania and New Jersey. See Brodie.

CARROLL, W. P. Special agent, Grain Standardization. See Leighty.

CATES, J. S. Assistant agriculturist, Farm Management Investigations. Studies weed problems in Texas, Louisiana, North Carolina, South Carolina, Georgia, and other States. See Smith, C. B.

CHAMBERLAIN, J. S. Physiological chemist, Grain Investigations. Engaged in the study of the proteids of wheat. Work is conducted chiefly in the laboratory at Washington, D. C., but also includes investigations in cooperation with the Tennessee experiment station. The entire work in Washington is in cooperation with the Bureau of Chemistry. The objects are to determine by chemical

Chamberlain, J. S.--Continued.

analyses the proteid content of different varieties and types of grain, both native and introduced, in order to ascertain the actual value from this standpoint of new or improved varieties, thus giving necessary aid in the improvement of wheat. All of the work is closely related to the introduction and adaptation experiments with different grain crops. Expenses this year sustained by the Bureau of Plant Industry, about \$2,500. Dr. Chamberlain is assisted by Mr. H. W. Houghton.

CHARLES, VERA K. Assistant in plant pathology. See Patterson.

CHILCOTT, E. C. Agriculturist in charge of Dry Land Agriculture Investigations. Work is being conducted in the Great Plains Area, bounded by the 98th and 104th meridians and the 32d and 49th parallels, covering about 330,000 square miles. Close cooperation is maintained with the experiment stations of North Dakota, South Dakota, Nebraska, Colorado, Kansas, Oklahoma, and Texas. The objects of the work are to determine the best method of crop rotation, the most suitable crops, and the cultural methods best suited for the conservation of moisture and the maintenance of humus. Expenses this year, about \$20,000, of which \$11,500 is for salaries and \$8,500 for traveling and other miscellaneous expenses. Prof. Chilcott is assisted by Charles A. Jensen and a corps of special field agents. The work is closely related to that of Mr. C. S. Scofield, described elsewhere in these pages; and Messrs. L. J. Briggs, T. H. Kearney, and Karl F. Kellerman are each engaged upon special problems in their respective lines of work (which see) in cooperation with Prof. Chilcott.

CLARKE, F. W. Assistant in drug plant and tea culture investigations. See True.

COBB, N. A. Expert, engaged in a pathological survey of Hawaii and in crop technology investigations. Work includes a study of the diseases of crops in Hawaii, in cooperation with the Federal experiment station, for the purpose of advising planters as to the best methods of controlling the diseases of their crops. The work on crop technology covers the development of improved apparatus and methods of standardizing grain, improved machinery for the work in dry land agriculture, and the improvement of technological methods in other lines of investigation of the Bureau. Expenses this year, about \$7,400, including salaries and necessary traveling and other miscellaneous expenses.

COBEY, W. W. Expert in tobacco investigations. See Shamel.

COLE, E. F. Assistant in Rotundifolia grape investigations, South Atlantic and Gulf States. See Husmann.

COLLINS, G. N. Assistant botanist, Bionomic Investigations of Tropical and Subtropical Plants. See Cook.

CONNER, A. B. Assistant, Forage Crop Testing and Extension. See Piper.

COOK, O. F. Bionomist in charge of Investigations of Tropical and Subtropical Plants. Field work on tropical plants is being conducted to ascertain the factors which control the growth of the principal commercial crops, and to obtain new varieties and methods of culture specially adapted to the

Cook, O. F.--Continued.

tropical possessions of the United States, and also to subtropical latitudes. Central American varieties of cotton resistant to the boll weevil are being acclimatized in Texas, and also tropical types of corn which promise to be of value in the South and Southwest. The tropical cultures which are being given most attention are coffee, rubber, cacao, and the tropical fruits, such as the mango, avocado, and banana, all of which can be produced commercially in Porto Rico, Hawaii, and the Philippines, though now imported very largely from foreign countries. Expenses this year in these lines of work, about \$18,000, of which \$12,500 is for salaries and \$5,500 for traveling and other miscellaneous expenses. Mr. Cook is assisted by Messrs. G. N. Collins, H. Pittier, F. L. Lewton, and J. H. Kinsler.

CORBETT, L. C. Horticulturist in charge of Arlington (Va.) Experimental Farm. Work includes the general supervision and improvement of the Farm; maintenance of a model fruit garden and kitchen garden; tests of vegetables and flowers under cloth shade; a study of the influence of heat, light, and moisture on greenhouse crops; a quantitative investigation of the transpiration of economic plants; a study of the adaptation of varieties of potatoes to the various potato-growing sections of the United States, in cooperation with the experiment stations of Vermont, Wisconsin, Texas, West Virginia, and Colorado; a comprehensive truck crop survey of the United States; and an investigation of the Bermuda onion industry in southern Texas, with a view to determining a suitable location for the production of seed. In connection with the work of the

Corbett, L. C.--Continued.

Farm a cooperative truck station is maintained with the Virginia experiment station. The expenses of the Farm and of its allied investigations this year are about \$25,000, including salaries, hiring of temporary labor, and other miscellaneous expenses.

Prof. Corbett is assisted by Messrs. Earl C. Butterfield and W. V. Shear.

CORY, V. L. Assistant, Grain Investigations.
See Carleton.

COTTON, J. S. Assistant agriculturist, Farm Management Investigations. Studies the production of forage for beef cattle and sheep.
See Smith, C. B.

COVILLE, FREDERICK V. Botanist in charge of Taxonomic Investigations. Work is conducted in Washington, D. C., supplemented by field studies where necessary. Cooperation with the U. S. National Museum is in effect. The work has for its objects the securing of authentic information in regard to native and cultivated plants of economic importance, in order to make available an accurate botanical knowledge of these plants and records of their value and uses. Special additional investigations this year are the study of the plants used by the aborigines; completion of an authoritative manual of the flora of Alaska; and the preparation of a catalogue of the botanical literature in the various Government libraries in Washington. Expenses this year, about \$8,100, of which \$6,240 is for salaries and \$1,900 for traveling and other miscellaneous expenses. The investigations of Messrs. Dewey, Hitchcock, Safford, Tyler, and Wight, described elsewhere in these pages, are directed by Mr. Coville.

CRAWFORD, A. C. Pharmacologist, Poisonous Plant Investigations. Engaged in investigations of the poisonous action of the mountain laurel, death camas, mistletoe, and other poisonous plants, and of the loco weed disease of horses, cattle, and sheep. Work consists of laboratory studies at Washington, D. C., in conjunction with the field investigations of Dr. C. Dwight Marsh (described later). The object of the work on the mountain laurel is to secure a knowledge of the active principle and a satisfactory means of treating laurel poisoning in animals. The work on the death camas, a plant which is markedly injurious to stock, has for its objects the isolation and determination of the poisonous constituents of the plant and the attainment of knowledge of the nature of the poison and a practical method of treating cases under ranch conditions. The mistletoe work includes laboratory studies to learn the nature of the active principle with reference both to poisonous action and to value as a remedial agent in Zygodenus (death camas) and other kinds of stock poisoning. Expenses this year, about \$4,000, of which \$2,500 is for salaries and \$1,500 for traveling and other miscellaneous expenses.

CROSBY, M. A. Assistant agriculturist, Farm Management Investigations, District No. 2, including Alabama, Mississippi, and Tennessee. See Brodie.

LENNIS, S. J. Expert in technical fruit refrigeration and transportation problems. See Powell.

DERK, H. B. Assistant, Grain Investigations. See Carleton.

DEWEY, LISTER H. Botanist, Taxonomic Investigations. In charge of fiber plant investigations. Work is being conducted at Washington, D. C., in Porto Rico and Hawaii, and also in Kentucky, Minnesota, Michigan, Nebraska, California, and Oregon. Cooperation with the experiment stations in Porto Rico and Hawaii is in effect. The objects of the work are the introduction of hard fiber industries in Porto Rico and Hawaii; improvement in the quality of hemp and flax; and better methods of handling these and other fiber crops. Work covers investigations as to conditions under which fiber plants may be cultivated with profit, and other problems connected with fiber plant industries. Expenses this year, about \$4,500, of which \$2,500 is for salaries and \$2,000 for traveling and other miscellaneous expenses.

DODGE, L. G. Assistant agriculturist, Farm Management Investigations, District No. 5, including New York and the New England States. See Brodie.

DRAKE, J. A. Assistant agriculturist, Farm Management Investigations. Studies methods and implements of tillage. See Smith, C.B.

DUVEL, J. W. T. Assistant, Seed Laboratory and Grain Standardization. Engaged in investigations to determine the conditions affecting the vitality of seeds, giving special attention to the harvesting, curing, and storing, as well as methods of testing, seed corn, in order to insure stronger vitality. Investigations relating to the effect of climate on the vitality of stored seed, and the value of cold storage as a means of preserving the vitality of certain classes of seeds, are being carried on in

Duvel, J. W. T.--Continued.

cooperation with the Weather Bureau, the experiment stations, and others. Work is also being conducted to determine the longevity of weed seeds when buried in the soil, to furnish a basis for further studies in methods of eradicating noxious weeds. The necessary expenses connected with these lines of work are borne by the Seed Laboratory (see Brown, Edgar). Dr. Duvel is also engaged in devising special apparatus and methods for the work in Grain Standardization (see Shanahan), giving special attention to the development of a quick method for the determination of moisture in commercial grain.

EUSTACE, H. J. Expert in fruit transportation and storage investigations in Iowa and California. See Powell.

EVANS, JAMES A. Special agent, Cotton Culture Demonstration Farms. See Knapp.

EVANS, H. M. Assistant, Forage Crop Testing and Extension. See Piper.

FAIRCHILD, DAVID. Agricultural explorer in charge of Foreign Seed and Plant Introduction. Work is conducted through agricultural explorers sent to foreign countries in search of rare and valuable seeds and plants suitable for cultivation in various parts of the United States, especially in the arid West where crops which will prove profitable are greatly needed. Work in the propagation and testing of the various seeds and plants thus secured is being conducted all over the United States in cooperation with private

Fairchild, David--Continued.

individuals. The work is closely related to and forms a large part of that of the plant introduction gardens located at Chico, Cal. (see Mayer), and Brownsville, Tex. (see Green). Among the valuable new industries being established are such as the date palm, mango, pistache, matting rush, bamboo, cork oak, and chayote; and European hops and phylloxera-resistant grapes are also being introduced. Expenses this year in these phases of the work, about \$20,000, of which \$6,500 is for salaries and \$13,500 for traveling and other miscellaneous expenses, including the purchase and importation of rare seeds and plants. Mr. Fairchild is assisted by Messrs. O. W. Barrett and Walter Fischer. The investigations of Messrs. Meyer, Mann, Norgord, and Tull, described elsewhere in these pages, are directed by Mr. Fairchild.

FAWCETT, GEORGE L. Assistant, Subtropical Laboratory and Garden, Miami, Fla. See Bessey.

FISCHER, WALTER. Assistant, Foreign Seed and Plant Introduction. See Fairchild.

FITZ, L. A. Assistant, Grain Standardization. In charge of grain standardization laboratory at Baltimore, Md. Work consists in examining and promptly reporting upon, in accordance with law, all samples of grain submitted. Arrangements have been made to secure samples of all grain passing through Baltimore market. These samples are examined for the purpose of obtaining information toward the establishment of definite commercial standard grades for the various grains. The results of the examinations, which regard quality and condition, percentage

Fitz, L. A.--Continued.

of foreign material and of damaged grain, weight of grain per bushel, etc., are stated on printed blanks which constitute certificates of the Department of Agriculture. The Baltimore laboratory is equipped with moisture determining and other necessary apparatus, and is the headquarters for considerable investigational work in connection with carrying out the law providing for the work of Grain Standardization. Expenses this year, about \$4,500, of which \$2,500 is for salaries and \$2,000 for equipment and other miscellaneous expenses. Mr. Fitz is assisted by Mr. C. A. Neal.

FLETCHER, W. F. Assistant in fruit district investigations. See Gould.

FREEMAN, E. M. Pathologist, Grain Investigations. Engaged in investigations of the rusts and smuts of cereals. Field work is conducted in practically all of the grain producing States, particularly North Dakota, South Dakota, Minnesota, Kansas, and Texas. Much laboratory investigation also is necessarily connected with this work. Studies of the life histories of the principal grain rusts and smuts are made, with the object of the prevention of these troubles. It is also the aim to discover all the different host plants other than grains which harbor these parasites, in order so to arrange the crops, as far as possible, that the parasites will not transfer from other wild hosts to the grains. Laboratory cultures of the different species of rusts and smuts are made, and much greenhouse work is carried on. In the field a study is made of the varieties of grain that resist rust. Expenses this year, about \$4,000, including salaries, travel, and other miscellaneous expenses.

January 1st 1881

My dear Mr. [Name] I have just received your letter of the 28th inst. and am glad to hear that you are well. I am also well and hope these few lines will find you the same. I have not much news to write at present. The weather here is very cold and the snow is deep. I have not been out much lately. I have been thinking of writing you for some time but have not had time. I hope to hear from you soon. I am, dear Mr. [Name], very truly yours, [Signature]

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GARNER, W. W. Assistant in tobacco investigations. See Shamel.

GILBERT, W. W. Assistant in plant pathology. See Orton.

GOLL, F. L. Assistant, Soil Bacteriology Investigations. See Kellerman.

GOSS, W. L. Assistant, Seed Laboratory. See Brown, Edgar.

GOULD, H. P. Assistant pomologist, Field Investigations in Pomology. Engaged in fruit district investigations. Work is being conducted in New York, Virginia, West Virginia, North Carolina, Tennessee, Missouri, Arkansas, and Oklahoma. Cooperative phenological observations are also being made by fruit growers in practically every State and Territory. The work has for its object the determination of the adaptability of fruit varieties to different conditions, and the correlation of cause and effect in their behavior. The aim is so to determine the influence of conditions upon varieties that it will be possible to select varieties and locations so related to each other that definite desired results may be reasonably assured in the further extension and development of the fruit growing industry. Efforts are at present being confined to orchard fruits. Expenses this year, about \$4,000, of which \$2,600 is for salaries and \$1,400 for traveling and other miscellaneous expenses. Mr. Gould is assisted by Mr. W. F. Fletcher.

GREEN, EDWARD C. Pomologist in charge of Plant Introduction Garden, Brownsville, Tex. This garden has been recently established on a part of the Fort Brown military reservation.



Green, Edward C.--Continued.

Cooperation with the Texas experiment station is in effect. The work has for its objects the testing and propagation of various seeds and plants believed to be especially suited to culture in south Texas, and to determine the possibilities of the region in subtropical horticulture. Recently imported Japanese matting rushes are being grown at the garden, as well as other plants which give promise of local adaptability. Expenses this year, about \$8,000, of which \$4,500 is for salaries and \$3,500 for the miscellaneous expenses incident to the establishment and maintenance of the garden.

GRIFFITHS, DAVID. Assistant, Farm Management Investigations. Engaged in range and cactus investigations. Range investigations are being conducted in Arizona, California, Nebraska, South Dakota, Montana, Washington, and Idaho. The work in Arizona and Washington is conducted in cooperation with the experiment stations. The object of the work is to study range practices with a view to the improvement of native pastures by re-seeding and to study native pasture feeds in general. The cactus work is being conducted in Texas, Arizona, New Mexico, and California, in cooperation with the experiment stations, especially those in the three latter, and with private individuals. The work has for its object the testing of native and introduced species of cacti, the study of the growth, chemical composition, and nutritive value of the plant and fruit as food for both man and beast, and the improvement of species in relation to objectionable characteristics and hardness by breeding and selection, methods of feeding, harvesting, cultivating, etc. Expenses this year in

Griffiths, David--Continued.

these lines of work, about \$7,000, of which \$3,500 is for salaries and \$3,500 for traveling and other miscellaneous expenses.

HARTER, L. L. Assistant physiologist, Plant Breeding Investigations. See Kearney.

HARTLEY, C. P. Physiologist, Plant Breeding Investigations. In charge of corn breeding. Variety tests with very early, medium, or late maturing varieties are being conducted in cooperation with the experiment stations of Alabama, Arkansas, Colorado, Connecticut, Florida, Georgia, Idaho, Kansas, Kentucky, Maryland, Massachusetts, Michigan, Minnesota, Missouri, New Hampshire, New York, North Carolina, North Dakota, Ohio, Rhode Island, South Carolina, South Dakota, Tennessee, Utah, Virginia, and Washington. Much cooperative work is also carried on with practical farmers in various States in the breeding of field corn, particularly with corn growers in Ohio, Tennessee, Wisconsin, and Maryland. Experimental work is also being conducted at the Plant Introduction Garden, Chico, Cal., and near Washington, D. C. The object of the work is the development of greater yielding strains of corn possessing desirable characters and suited to the climatic and soil conditions of various sections. Breeding work with sweet corns is being carried on in cooperation with canneries in New York and Ohio, having for its object the development of better strains for canning purposes and the elimination of the present practice of artificially sweetening canned corn. In cooperation with the Bureau of Chemistry and with the experiment stations of Florida, South

Hartley, C. P.--Continued.

Carolina, Maryland, Connecticut, and Maine, work having for its object the determination of the effect of climate and soil upon the formation of sugar in sweet corn is being carried on. Expenses this year, about \$12,500, of which \$6,000 is for salaries and \$6,500 for traveling and other miscellaneous expenses. Mr. Hartley is assisted by Mr. Ernest B. Brown.

HAWKINS, L. A. Assistant, Investigations of Diseases of Fruits. See Shear, C. L.

HEADLEY, F. B. Assistant, Western Agricultural Extension. Superintends San Antonio, Tex., Experiment Farm. See Scofield.

HEDGCOCK, GEORGE G. Assistant in forest pathology. See Metcalf.

HEDGES, FLORENCE. Assistant, Laboratory of Plant Pathology. See Smith, E. F.

HENKEL, ALICE. Assistant, Drug Plant Investigations. See True.

HIBEARD, R. P., Jr. Assistant, Soil Bacteriology Investigations. See Kellerman.

HILLEMAN, F. H. Assistant botanist, Seed Laboratory. See Brown, Edgar.

HITCHCOCK, A. S. Systematic agrostologist, Taxonomic Investigations. Engaged in the preparation of a manual of the American grasses. Work is performed at Washington, D. C., supplemented by field work in the Rocky Mountain region and the Middle Atlantic and Southern States. The work has for its object the collection of authentic

Hitchcock, A. S.--Continued.

information regarding American grasses, their variation, adaptability, and economic features, to be embodied in a manual of the American grasses. Monographs of special groups are being prepared in advance of the completion of the manual. The work consists in studies in the field, collection, identification, and description of the grasses, with a digest of notes and observations as to the value of the different species for forage and other economic purposes. Expenses this year, about \$5,600, of which \$4,900 is for salaries and \$700 for traveling and other miscellaneous expenses. Mr. Hitchcock is assisted by Mr. P. L. Ricker.

HOOD, S. C. Assistant, Drug Plant Investigations. See True.

HOSFOLD, G. W. Assistant in fruit marketing, transportation, and storage investigations. See Powell and Taylor.

HOUGHTON, H. W. Assistant, Grain Investigations. See Chamberlain.

HUNTER, BYRON. Assistant agriculturist, Farm Management Investigations, District No. 6, including Oregon, Washington, and Idaho. See Brodie.

HUSHANN, GEORGE C. Pomologist, Field Investigations in Pomology. Engaged in viticultural investigations. Work is being conducted in California and in the South Atlantic and Gulf coast States; and miscellaneous problems connected with the grape industry are studied in other parts of the country. Cooperation with the California and North Carolina experiment stations as in effect.

Husmann, George C.--Continued.

Ten experimental vineyards are being conducted in California, in cooperation with the office of Foreign Seed and Plant Introduction. The object of the work in California is the preservation, improvement, and development of the Vinifera grape industry of the United States. In the South Atlantic and Gulf coast States special attention is being paid to the development of the Rotundifolia grapes as represented by the Scuppernong and allied varieties. Miscellaneous viticultural problems are being worked out, with special reference to securing information for all parts of the country on the pruning, training, grafting, and culture of the vines, and the varieties best suited for various purposes in different sections of the country; also on the best methods of handling, keeping, and marketing the fruit, as well as of the manufacture, storing, care, and disposition of the products made therefrom. Expenses this year, about \$10,000, of which \$4,000 is for salaries and \$6,000 for traveling and other miscellaneous expenses. Mr. Husmann is assisted by Messrs. E. F. Cole and Alfred Tournier.

IRWIN, W. K. Assistant in fruit identification and description, Pomological Collections. See Brackett.

JARDINE, W. M. Agronomist, Grain Investigations. Engaged in investigations of dry land cereals. Work is being conducted chiefly in the Great Plains Area and the dry and high intermountain districts of the West. A large part of the work consists of adaptation experiments with the different varieties

Jardine, W. M.--Continued.

of durum wheat and the development of pure types of these wheats. Special attention is also being given to emmer and its different varieties. Thorough trials of some newly introduced varieties, notably the Black Winter, which are found to be winter hardy are being made to determine their local adaptation in different portions of the Great Plains and intermountain districts. In this work is also included considerable study of the subject of earliness in grains, with the idea of establishing varieties that will ripen early enough to escape the most severe stages of drought. The work is closely related to other adaptation work with cereals. An attempt is being made to develop or secure sorghums and millets that will mature in higher latitudes and at higher altitudes. Expenses this year, about \$6,500, of which \$5,000 is for salaries and \$1,500 for traveling and other miscellaneous expenses.

JENSEN, CHARLES A. Agriculturist, Dry Land Agriculture Investigations. See Chilcott.

JOHNSTON, JOHN R. Assistant, Laboratory of Plant Pathology. See Smith, E. F.

KEARNEY, THOMAS H. Physiologist, Plant Breeding Investigations. Engaged in the breeding of field crops resistant to alkali and to drought. Work on alkali resistance is being conducted in Nebraska, Utah, Arizona, Nevada, and in the laboratory at Washington, D. C., having for its object the securing, by selecting seed from the most resistant plants, of strains that will endure greater amounts of alkali in the soil than those commonly grown. The crops receiving principal

Kearney, Thomas H.--Continued.

attention are alfalfa, wheat, barley, oats, sugar beets, and sorghum. Cooperation in this work is practiced with the Nebraska experiment station. Work is also under way on the alkali resistance of the date palm. The work of breeding drought-resistant field crops is being conducted in Arizona, South Dakota, and other localities of the arid West, cooperation with the South Dakota experiment station being practiced. The work has for its object the production of strains of forage plants, sugar beets, and other field crops resistant to drought and therefore adapted to dry land agriculture. The work is closely related to the other lines of work conducted by the Bureau in the arid and semiarid West. Work on the breeding of cottons for the arid Southwest is also being carried on, with a view to securing valuable strains of this crop suited to growth under irrigation. Expenses this year in these lines of work, about \$8,500, of which \$4,500 is for salaries and \$4,000 for traveling and other miscellaneous expenses. Mr. Kearney is assisted by Mr. L. L. Harter.

KELLERMAN, KARL F. Physiologist in charge of Soil Bacteriology and Water Purification Investigations. Work with leguminous plants is being conducted in cooperation with farmers in all parts of the United States, and with the experiment stations of New York, Ohio, North Carolina, Missouri, Kansas, and Wisconsin. The objects sought are the extension of the use of legumes as soil renovators by effective inoculation where the soil is lacking in the proper bacteria; the determination of the relation of soil bacteria to soil fertility; and the control of soil conditions favoring the bacteriologic

Kellerman, Karl F.--Continued.

flora. Water purification work is conducted as conditions demand in connection with water supplies in cities and towns, the object being to study means of controlling algal and bacterial pollutions, especially in connection with the use of copper as a treatment. Expenses this year in these lines of work, about \$16,500, of which \$11,000 is for salaries and \$5,500 for traveling and other miscellaneous expenses. Mr. Kellerman is assisted by Messrs. T. R. Robinson, T. D. Beckwith, F. L. Goll, and R. P. Hibbard, Jr.

KINSLER, JOHN H. Special agent in cultivation of weevil-resistant cottons. See Cook.

KLUGH, G. F. Assistant, Drug Plant Investigations. See True.

KNIAPP, S. A. Special agent in charge of Cotton Culture Demonstration Farms, with headquarters at Lake Charles, La. Farmers' institutes and demonstration work are being conducted in cooperation with representative farmers, chiefly in Texas and Louisiana, and also in Arkansas, Oklahoma, Mississippi, Tennessee, and Alabama. The object is to show farmers of the boll weevil districts the most practical methods of growing cotton despite the presence of the boll weevil, by the utilization of early maturing varieties, the use of fertilizers and proper methods of cultivation and tillage, the burning of stalks, and, in short, a thorough system of crop management, with the main idea of securing and making a crop, through the planting of early varieties, before the weevil has had opportunity to develop sufficiently to destroy completely the squares or bolls.

Knapp, S. A.--Continued.

Thousands of small demonstration plots of from 5 to 10 acres serve to awaken an interest in better methods; and farmers to the number of 100,000 cooperated in this work during the past year. Expenses this year, about \$70,000, of which \$45,000 is for salaries and \$25,000 for traveling and other miscellaneous expenses. Dr. Knapp is assisted by a corps of special field agents, Mr. James A. Evans being his principal assistant.

LE CLERC, J. A. Physiological chemist, Grain Investigations. Engaged in investigations of wheat nutrition, in close cooperation with the Bureau of Chemistry. Cooperative relations are also maintained with the experiment stations of South Dakota, Colorado, and Tennessee. It is the aim in this whole work to obtain a more complete knowledge of wheat nutrition, but a special object is to determine the causes of deterioration in the quality of wheat grown in certain seasons or localities. This malady is variously known as "yellow berry," "white spot," etc., and causes the grains it infests to be softer and much inferior in milling quality to the general run of the wheat. Experiments in different methods of cultivation and applications of different amounts of water for irrigation are conducted at various points, and chemical analyses are made of the grain obtained from these tests. Pot experiments are carried on both in the greenhouse and in the field. The expenses of this work are sustained jointly by the Bureau of Chemistry and the Bureau of Plant Industry, aggregating about \$2,500.

LEIDIGH, A. H. Assistant, Grain Investigations. Engaged in grain investigations in the Panhandle of Texas. Field experiments are being conducted, in cooperation with the Texas experiment station, at Amarillo and Chillicothe, the former point being the headquarters. The object of the work is to determine what can be done in the way of crop cultivation in that part of the country, but the results will be applicable to a considerably larger area than simply northwest Texas. Although chief attention is given to grains, a considerable amount of experimental work with other crops is conducted in cooperation with other offices of the Bureau. The work consists almost wholly in trials of different crops and different varieties, with the aim of developing distinct types thoroughly fitted to the locality. The whole country has heretofore been one vast cattle range with no cultivation of crops whatever, and it is hoped to introduce grains and forage crops which will be an important addition to stock feeding. Experiments in methods of cultivation and crop rotation are also being conducted. Expenses this year, about \$2,500, of which \$1,400 is for salary and \$1,100 for traveling and other miscellaneous expenses.

LEIGHTY, CLYDE E. Expert, Grain Standardization. In charge of grain standardization laboratory at New Orleans, La. Work consists in examining and promptly reporting upon, in accordance with law, all samples of grain submitted. These examinations are made for the purpose of obtaining information toward the establishment of definite commercial standard grades for the various grains. The results of the examinations, which regard quality and condition, percentage

Leighty, Clyde E.--Continued.

of foreign material and of damaged grain, weight of grain per bushel, etc., are stated on printed blanks which constitute certificates of the Department of Agriculture. The work at the New Orleans laboratory is deemed especially important, as it has to do with the grain that is handled in a warm climate. Large quantities of corn pass through the New Orleans market, and excellent opportunities are thus afforded for determining the relation of moisture content to carrying quality. The laboratory is equipped with moisture determining and other necessary apparatus. Expenses this year, about \$4,000, of which \$2,500 is for salaries and \$1,500 for equipment and other miscellaneous expenses. Mr. Leighty is assisted by Mr. W. P. Carroll.

LEWTON, F. L. Assistant in field experiments with weevil-resistant cottons, Bionomic Investigations. See Cook.

McCLELLAND, C. K. Assistant agriculturist, Farm Management Investigations, District No. 3, including Louisiana and Arkansas. See Brodie.

McCLURE, H. B. Assistant agriculturist, Farm Management Investigations. Studies hay production and utilization. See Smith, C. B.

McKEE, ROLAND. Assistant in forage crop experiments at Chico, Cal. See Piper.

McLANE, J. W. Assistant, Physical Laboratory. See Briggs.

MANN, ALBERT and C. P. NORGORD. Experts, Foreign Seed and Plant Introduction. Engaged in the introduction of pure races of brewing barleys. Work is being conducted in all of the present barley growing States and others that give promise of adaptation to this crop, cooperation with the Wisconsin experiment station being maintained. The objects of the work are to determine which races of pedigreed European barleys are best suited to brewing purposes in this country and to eliminate the confusion which now prevails regarding barley varieties. The aim is to ascertain which kinds of pure barley are most desirable and to encourage their cultivation on a large scale in the barley growing regions of the United States. The laboratory investigations connected with the work are conducted by Dr. Mann, while the field aspect is intrusted to Mr. Norgord. Expenses this year, about \$4,000, of which \$2,400 is for salaries and \$1,600 for traveling and other miscellaneous expenses.

MARSH, C. DWIGHT. Expert, Poisonous Plant Investigations. Engaged in investigations of the loco-weed disease of horses, cattle, and sheep. Work is being conducted in Colorado and Nebraska, in cooperation with the experiment stations of those States, and in Arizona, New Mexico, and other loco-infested sections. The object is the determination of the exact cause of the so-called loco disease in animals, and the prevention, by the extermination of the weeds and the devising of methods of counteracting the poison, of the immense losses now occasioned thereby to the stock-grazing interests of the West. The work consists of feeding experiments on horses, cattle, and sheep with white and purple and other loco weeds; and

Marsh, C. Dwight--Continued.

autopsies are performed on "locoed" animals placed at the disposal of the Department, in order to obtain confirmatory evidence of the conclusions reached. A laboratory study of the poisonous principles of the loco weeds and their effect on animals is being conducted by Dr. A. C. Crawford, Pharmacologist (see page 30), in connection with this field work. Expenses this year, about \$6,000, of which \$2,700 is for salaries and \$3,300 for traveling and other miscellaneous expenses.

MASON, SILAS C. Arboriculturist, Plant Life History Investigations. Engaged in investigations of dry land arboriculture, with special reference to deep-rooted or drought resistant tree crops adapted for culture in dry regions where no irrigation is practiced. Work is being conducted chiefly in California, Arizona, and Texas, with contemplated extension into Nevada, Utah, and other States west of the rainfall region of the Mississippi Valley. Investigations of fig culture are being made, especially of caprifig for drying purposes. Special attention is being given to securing thin-skinned figs of the Smyrna type equal to those now imported, and to the finding of assortments of caprifigs suitable for various fig growing regions, in order to render the operation of caprification cheaper and more certain than is now the case. The life history of various wild species of figs is being studied, and the climatic and soil requirements of the best existing sorts of figs and caprifigs are being ascertained. Expenses this year, about \$4,000, of which \$2,000 is for salaries and \$2,000 for traveling and other miscellaneous expenses.

MAYER, AUGUST. Expert in charge of Plant Introduction Garden, Chico, Cal. The garden is 80 acres in extent, and its work is conducted in close cooperation with the California experiment station. The work has for its objects the testing, propagation, and distribution of new and desirable varieties of seeds and plants secured by agricultural explorers in various parts of the world (see Fairchild), and also the improvement of plants by hybridization and selection. Forage crops, vegetables, fruits, and plants of all kinds except those adapted to tropical conditions or to latitudes of extreme cold are now under trial. The work is closely related to the investigations of Messrs. Fairchild, Piper, Husmann, and others, described elsewhere in these pages. Expenses this year, about \$9,000, of which \$5,000 is for salaries and \$4,000 for the miscellaneous expenses of maintenance.

METCALF, HAVEN. Pathologist in charge of Forest Pathology Investigations. This work is conducted in close cooperation with the Forest Service; and cooperation with the experiment stations, lumber companies, railroad and telephone companies, nurseries, etc., is also practiced. Among the subjects under investigation are diseases of southern pines; the cause of stain in wood pulp; diseases of oaks and other hard woods; the root rot and crown gall diseases of forest trees; and methods of treating fence posts and other woods to prevent decay. Fungicides for preventing the growth of wood fungi are also being studied. The objects of these investigations are to find methods for controlling and preventing the various diseases affecting trees and woods. Expenses this year, about \$10,500, of which \$5,500 is for

Metcalf, Haven--Continued.

salaries and \$5,000 for traveling and other miscellaneous expenses. Dr. Metcalf is assisted by Messrs. George G. Hedgcock and Perley Spaulding. In addition to the work on forest diseases Dr. Metcalf is identified with the general work of the Laboratory of Plant Pathology, with special reference to the study of rice diseases (see Smith, E.F.).

MEYER, FRANK N. Agricultural explorer, Foreign Seed and Plant Introduction. Engaged in agricultural explorations in north China and Manchuria, for the purpose of securing new and useful plants that are adapted to the climatic conditions of our Middle West. It is known that the climate of China and Manchuria more nearly approaches that of our Plains region than that of any other area of like size, and it is believed that the cultivated plants secured will be of great value to the northwestern United States. Among the cultures already introduced as a result of these explorations is a seedless Chinese persimmon, known as the Pekin, which has been tried and found to be superior in flavor to any of the Japanese persimmons, as well as hardier. Numerous other promising new varieties of fruits, vegetables, etc., have been secured and will be given a thorough trial. Expenses this year, about \$5,000, including necessary traveling expenses incident to the explorations.

MILES, GEORGE F. Assistant in plant pathology. See Shear, C. L.

MILLER, H. A. Assistant agriculturist, Farm! Management Investigations, District No. 8, including Virginia, Maryland, and Delaware. See Brodie.

MITCHELL, G. F. Assistant, Tea Culture Investigations. See True.

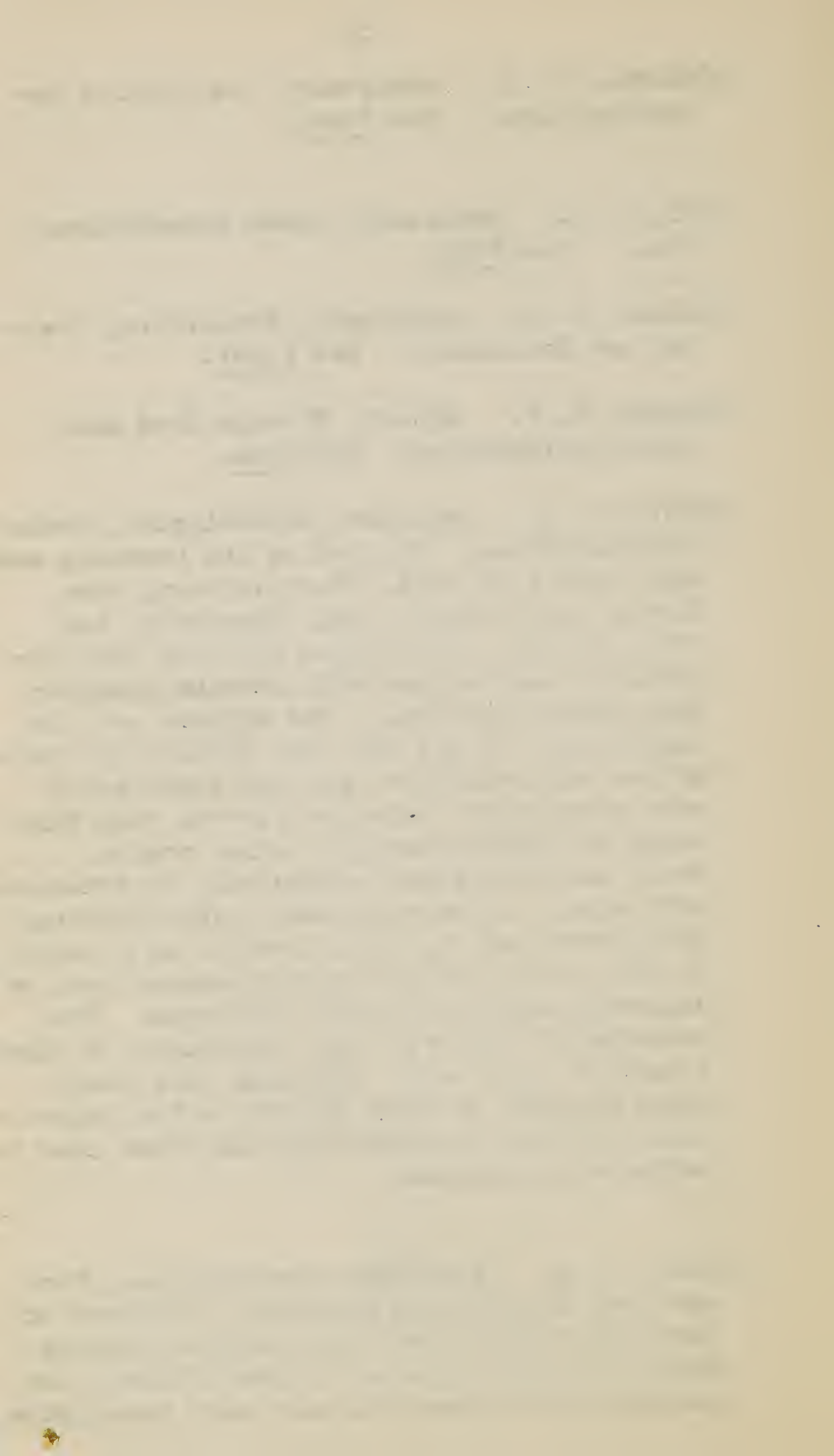
NEAL, C. A. Assistant, Grain Standardization. See Fitz.

NIELSEN, H. T. Assistant, Forage Crop Testing and Extension. See Piper.

NORGORD, C. P. Expert, Foreign Seed and Plant Introduction. See Mann.

NORTON, J. B. Assistant physiologist, Grain Investigations. Engaged in the breeding and improvement of oats. Work is being conducted in Illinois, Iowa, Wisconsin, and other States, cooperation with the Iowa experiment station and with private individuals being practiced. The objects are the improvement of the oat crop through hybridization and selection, and the securing of more productive varieties for the rich farm lands of the Mississippi Valley region, where oats are grown extensively in rotation with corn. A large-grained, high-yielding, early white oat has been secured as a result of this work; and new hybrid combinations of desirable sorts are being developed. The breeding of oats for rust resistance is also a part of this work. Expenses this year, about \$2,600, of which \$1,800 is for salaries and \$800 for traveling and other miscellaneous expenses.

OAKLEY, R. A. Assistant agrostologist, Forage Crop Testing and Extension. Engaged in investigations of new and standard grasses. Work is being conducted in many States, especially in Colorado, Kansas, Idaho, Washington,



Oakley, R. A.--Continued.

Nebraska, Maryland, Virginia, New York, Kentucky, and Texas. Cooperation with the experiment stations of Colorado, Kansas, Montana, North Dakota, Kentucky, West Virginia, and Texas is in effect. The objects of the work are the wider utilization of standard grasses and the introduction and extension of new and improved varieties. Experiments with meadow and pasture mixtures are being carried on, and valuable results have been secured with meadow fescue and with western wheat grass. Expenses this year, about \$4,400, of which \$2,800 is for salaries and \$1,600 for traveling and other miscellaneous expenses. Mr. Oakley is assisted by Mr. H. N. Vinall.

O'GARA, P. J. Assistant, Investigations of Diseases of Fruits. See Waite.

OLIVER, GEORGE W. Expert, engaged in experiments in the hybridization and propagation of plants. Work is being conducted in Texas, Arizona, California, and in the Department greenhouses at Washington, D. C., including the growing of Bermuda lilies from seed, with a view to eliminating the loss now incurred by florists through diseased bulbs; the hybridization of clover and alfalfa, to obtain new types which will be resistant to cold and disease; the improvement of lettuce by crossing, in cooperation with the Florida experiment station, the object being to secure varieties superior to those now in cultivation; the growing of tomatoes under glass, with a view to securing types better adapted to forcing than those now grown; the improvement of celery by hybridization, to eliminate the factor of pithiness and other undesirable characters; the improvement of

Oliver, George W.--Continued.

methods of propagating tropical fruits, such as the mango and mangosteen; and the hybridization of various flowering plants, such as chrysanthemums, dahlias, and roses. Expenses this year, about \$2,500, of which \$1,800 is for salaries and \$700 for traveling and other miscellaneous expenses.

ORTON, W. A. Pathologist, engaged in investigations of diseases of cotton, truck crops, pecans, and other crops in the Southeastern States. Work is being conducted in Virginia, North Carolina, South Carolina, Georgia, Alabama, and Florida. Cooperation with the experiment stations of North Carolina, Alabama, and Florida is in effect. The objects of the work are to study cotton diseases and to breed wilt resistant varieties, with special reference to aiding cotton growers in boll weevil districts; to breed wilt resistant cowpeas and watermelons; to study pecan diseases and find means of their control or prevention; to work out methods for the control of diseases of the cucumber, potato, and other truck crops, and to investigate the comparative resistance of varieties; and to study the general prevalence of plant diseases in the United States. For the latter purpose a comprehensive plant disease survey is conducted in cooperation with the State experiment stations. In the work on potato diseases cooperation with the Vermont experiment station is practiced. Expenses this year, about \$7,500, of which \$3,500 is for salaries and \$4,000 for traveling and other miscellaneous expenses. Mr. Orton is assisted by Mr. W. W. Gilbert.

PATTERSON, Mrs. F. W. Mycologist in charge of Pathological Collections. Work is conducted entirely at Washington, D. C., and includes the identification of material received from correspondents; critical identifications for the pathological workers of the Bureau and for the collaborators assisting in the plant disease survey; and the maintenance of mycological and host indexes of both American and foreign species. The work also includes the inspection of all plants imported by the office of Foreign Seed and Plant Introduction, as well as those prepared for deportation. Microscopic examinations for the presence of parasitic fungi are made, to guard against the introduction of new diseases with the imported material. Health certificates, to meet the requirements of various States, are prepared for all consignments found free from injurious disease; while diseased plants or those under suspicion are sent, unless condemned, to the quarantine house of the Bureau with advice for treatment. The inspection work also includes frequent examinations of the Department greenhouses, with reports upon their condition and recommendations for the treatment of diseased plants. Expenses this year, about \$4,500, of which \$3,500 is for salaries and \$1,000 for miscellaneous expenses. Mrs. Patterson is assisted by Miss Vera K. Charles.

PEARCE, JULIA R. Assistant, Physical Laboratory. See Briggs.

PECK, W. A. Assistant agriculturist, Farm Management Investigations. Engaged in investigations of the application of business systems in farming. The work is not confined

Peck, W. A.--Continued.

to any particular States, but is closely related to the other farm management work conducted by the Bureau in all parts of the country. A careful study is made of the various factors of production and their interrelation, including capital, equipment, labor, and the arrangement of cropping systems with a view to securing the greatest economy of equipment and labor. A study of the cost of all classes of farm operations is being made; and methods of farm bookkeeping are being worked out, including the keeping of accounts and the various classes of farm records. The records obtained in the conduct of object-lesson farms (see Brodie) are kept and used in connection with this work. Expenses this year, about \$2,500, of which \$1,200 is for salaries and \$1,300 for traveling and other miscellaneous expenses.

PETERSON, W. A. Special agent, Western Agricultural Extension. Conducts experimental farm at Yuma, Ariz. See Scofield.

PIPER, C. V. Agrostologist in charge of Forage Crop Testing and Extension. Work is being conducted in many States in cooperation with individuals, and cooperation with the experiment stations of Maryland, North Carolina, Texas, and Washington is in effect. The work has for its objects the improvement of the methods of handling forage crops, the introduction of standard crops into sections where they are not well known, the introduction of new and improved varieties throughout the United States, and the testing of crops adapted to special conditions. The work covers all forage crops and those used especially for soil improvement. Close connection is maintained with the various

Piper, C. V.--Continued.

related lines of work of the Bureau, and co-operation with the Bureau of Chemistry is also under way. Expenses this year in these phases of the work, about \$12,500, of which \$10,000 is for salaries and \$2,500 for traveling and other miscellaneous expenses.

Prof. Piper is assisted by Messrs. A. B. Conner, H. T. Nielsen, Roland McKee, and M. M. Evans; and he also directs the investigations of Messrs. Oakley and Westgate, described elsewhere in these pages.

PITTIER, H. Special agent, Bionomic Investigations of Tropical and Subtropical Plants. See Cook.

POWELL, G. HAROLD. Pomologist in charge of fruit transportation and storage investigations, in addition to associate supervision of the Field Investigations in Pomology. Work on the transportation of citrus fruits is being conducted in California and Florida; of deciduous fruits in California, Iowa, New York, and other eastern States, the work in Iowa and certain phases of that in New York being in cooperation with the experiment stations of those States. The objects of the work are to determine the factors that govern the successful shipping and keeping of perishable fruits; to bring about improvement in the methods of handling and shipping fruits; and to determine practical methods of farm fruit storage. The work is closely related to the fruit marketing investigations (see Taylor). Expenses this year, about \$33,000, of which \$12,000 is for salaries and \$21,000 for traveling and other miscellaneous expenses, including the securing and equipment of a car for the transportation experiments. Mr. Powell is assisted

Powell, G. Harold--Continued.

by Messrs. A. V. Stubenrauch, L. S. Tenny,
S. J. Dennis, H. J. Eustace, G. W. Hosford,
and H. M. White.

QUINN, C. E. Assistant, Farm Management In-
vestigations. Studies corn production and
utilization. See Smith, C. B.

RABAK, FRANK. Expert, Drug Plant Investiga-
tions. See True.

RAGAN, W. H. Expert in pomological nomencla-
ture, Pomological Collections. See Brackett

REED, J. F. Assistant in sugar beet seed
growing. See Tracy, J.E.W.

RICKER, P. L. Assistant, Taxonomic Investi-
gations. See Hitchcock.

RITTUE, E. C. Assistant, Sugar Beet Investi-
gations. See Townsend.

ROBINSON, T. R. Assistant physiologist, Soil
Bacteriology Investigations. See Kellerman.

ROSER, JAMES E. Assistant, Investigations of
Diseases of Fruits. See Scott.

SAFFORD, W. E. Assistant curator, Taxonomic
Investigations. Engaged in preparing for
publication the information regarding Ameri-
can economic plants secured by Dr. Edward
Palmer during forty years of travel as a
botanical collector. The work is carried on
at Washington, D. C., and in Mexico. The
object is to make available in a publication

Safford, W. E.--Continued.

the valuable information contained in Dr. Palmer's notes, and the authentic identification of the plants referred to therein. Expenses this year, about \$2,400, of which \$1,800 is for salary and \$600 for traveling and other miscellaneous expenses.

SAUNDERS, D. A. Special agent in cotton breeding, Texas, Louisiana, and Georgia. See Shamel.

SAYLOR, C. F. Special agent, Sugar Beet Investigations, with headquarters at Des Moines, Iowa. Engaged in investigations of beet sugar production. This work is related to the other lines of sugar beet work conducted by the Bureau (see Townsend; Tracy, J.E.W.). The objects are to ascertain the progress of the beet sugar industry in the United States; to develop the domestic production of sugar from beets; and to find out the best methods of increasing the tonnage of sugar beets. Expenses this year, about \$4,500, of which \$2,700 is for salaries and \$1,800 for traveling and other miscellaneous expenses. Mr. Saylor submits annually to the Secretary of Agriculture a report on the Progress of the Beet Sugar Industry in the United States, which is published in the series of reports of the Office of the Secretary.

SCHERFFIUS, W. H. Expert in tobacco investigations, Kentucky, Tennessee, and Ohio. See Shamel.

SCHMITZ, NICKOLAS. Expert, Forage Crop Testing and Extension. See Westgate.

SCOFIELD, CARL S. Agriculturist in charge of Western Agricultural Extension. Work is being conducted at Yuma, Ariz., Fallon, Nev., Belle Fourche, S. Dak., Snyder, Okla., and San Antonio, Tex., at the first three points named in cooperation with the Reclamation Service of the Department of the Interior. The object is the extension of profitable agriculture into regions now unproductive. At San Antonio an experimental farm is conducted, the work at this point having a special bearing on the boll weevil problem. The practicability of growing other crops in this region in rotation with cotton is being demonstrated, as well as proper methods of tillage and moisture conservation. All of this work is carried on in close cooperation with Dry Land Agriculture Investigations (see Chilcott), and with other offices of the Bureau. Expenses this year, about \$18,000, of which \$11,000 is for salaries and \$7,000 for traveling and other miscellaneous expenses. Mr. Scofield is assisted by Mr. F. B. Headley at the San Antonio experiment farm and by Mr. W. A. Peterson at Yuma, Ariz.

SCOTT, W. M. Pathologist, Investigations of Diseases of Fruits. Engaged in spraying demonstrations for the control of orchard diseases. Work is being carried on in Nebraska, Missouri, Arkansas, and Virginia. Cooperation with the Missouri (Fruit) and Nebraska experiment stations is in effect. The objects of the work are to perfect methods of spraying for orchard diseases and to secure the general adoption of such methods by growers. Field demonstrations are made in individual orchards as a means to this end. Investigations are also being conducted on the brown rot of the peach, plum, and

Scott, W. M.--Continued.

other stone fruits, the object being to obtain more complete knowledge of this disease, which now destroys millions of dollars' worth of fruit, and to discover a specific remedy or method of its prevention. Expenses this year in these lines of work, about \$7,000, of which \$4,000 is for salaries and \$3,000 for traveling and other miscellaneous expenses. Mr. Scott is assisted by Mr. James B. Rorer.

SHAMEL, A. D. Physiologist in charge of Cotton Breeding and Tobacco Breeding. Work on tobacco is being conducted in Connecticut, Maryland, Virginia, Alabama, Georgia, Florida, Texas, Kentucky, Tennessee, and Ohio. Close cooperation with the Connecticut and Maryland experiment stations is in effect. The work has for its objects the improvement, by breeding and selection, of cigar wrapper and filler tobaccos, smoking and export tobaccos, etc.; improvement in cultural methods, the harvesting and care of the seed, and the handling of the seedlings; the prevention of pole burn in tobacco curing barns; and the combating of diseases of tobacco. Investigations of the burning and other qualities of the new varieties developed are being conducted, and special machinery for testing the burn has been developed. The work also includes the securing of suitable cover crops for tobacco fields, vetches and other leguminous crops being under experiment for this purpose. In connection with the tobacco breeding work, some experiments in the breeding of rust-resistant asparagus are being carried on in cooperation with the Massachusetts experiment station. The cotton breeding work is conducted in North Carolina, South Carolina, Georgia, Texas, Tennessee

Shamel, A. D.--Continued.

Louisiana, Arkansas, Oklahoma, Arizona, and New Mexico. Cooperation with the Texas and Tennessee experiment stations is in effect. The objects are to obtain increased yield, longer and better fiber, earliness of maturity to prevent injury by the boll weevil, and the development of weevil resisting characters. Particular attention is given to the Upland types of cotton; and experiments are also being carried on in the breeding and introduction of Egyptian cottons. Expenses this year, tobacco breeding, about \$36,000; cotton breeding, \$23,000. Of these amounts about \$37,000 is for salaries and \$22,000 for traveling and other miscellaneous expenses. Associated with Mr. Shamel in the tobacco work are Messrs. W. H. Scherffius, W. W. Cobey, J. B. Stewart, V. C. Brewer, and W. W. Garner; and in the work on cotton Messrs. R. L. Bennett, D. N. Shoemaker, D. A. Saunders, S. M. Bain, E. B. Boykin, and H. A. Allard.

SHANAHAN, JOHN D. Expert in charge of Grain Standardization. The work consists in the organization and supervision of the investigations imposed by the act of Congress establishing laboratories for the fixing of definite grades of commercial grain. A general study of the methods of grain grading now in use and their correlation to the percentage method worked out by the Department of Agriculture is being made. The latter method includes the determination of moisture, dirt, shriveled grain, sound grain, etc. A special apparatus for determining the moisture content has been devised which renders such determination possible in twenty minutes, whereas it formerly required from 24 to 48 hours. A great lack of

Shanahan, John D.--Continued.

uniformity exists in the ordinary commercial methods of grading grain, and dealers are becoming convinced as a result of this work that a definite and honest grade, which can be mathematically fixed and is fair to all, is the only basis upon which grain grading can finally rest with security. Expenses this year in these features of the work, about \$12,000, including salaries and other miscellaneous expenses of organization. The investigations of Messrs. Boerner, Fitz, and Leighty, and a part of those of Mr. J. W. T. Duvel, described elsewhere in these pages, are directed by Mr. Shanahan.

SHEAR, C. L. Pathologist, engaged in investigations of diseases of small fruits, and also diseases of cotton in the Southwestern States. The work on small fruits is at present confined chiefly to diseases of the grape and cranberry. It is being conducted mainly in New Jersey and Pennsylvania, but also in New York and the New England States. In the work on grape diseases there is nominal cooperation with the Pennsylvania experiment station. The work has for its objects the securing of a complete knowledge of the fungous parasites which produce the diseases, especially of their methods of growth, reproduction, and manner of infection, and also the most practical, economic, and effective means of combating them. The work on cotton diseases is being conducted chiefly in Texas, and has for its object the securing of full information regarding the Texas root-rot especially, and the finding of a practical method of the prevention of this disease. Expenses this year, about \$6,500, of which \$5,000 is for salaries and \$2,000 for traveling and other miscellaneous expenses. Dr.

Shear, C. L.--Continued.

Shear is assisted by Messrs. George F. Miles and L. A. Hawkins.

SHEAR, W. V. Assistant, Arlington Experimental Farm. See Corbett.

SHOEMAKER, D. N. Expert in cotton breeding. See Shamel.

SMITH, C. B. Assistant in scientific horticulture, Farm Management Investigations. In general charge of investigations of special phases of farm practice. This work includes the diversification of crops on the rice lands of the South; studies of the use of winter cover crops in the South; the utilization of silage and the use of soiling crops, particularly in Michigan, Wisconsin, New York, New Jersey, and Pennsylvania; investigations of weeds and methods of their eradication, chiefly in Texas, Louisiana, North Carolina, South Carolina, and Georgia; the production and utilization of various leguminous crops; a study of farm practice in potato culture, and also in cereal culture; investigations of hay production and utilization, and of grasses and forage plants in the Gulf coast region, with special reference to the cultivation of cassava; a study of farm practice in corn culture, and also in sorghum culture; investigations of forage for beef cattle, sheep, and hogs; a study of methods and implements of tillage, and also of manures and fertilizers; and an investigation of farm practice in commercial seed growing. Most of these investigations are common to the whole country, but the work in the South has special reference to the boll weevil problem and the diversification of crops in the cotton belt. Expenses this

Smith, C. B.--Continued.

year in these lines of work, about \$20,000, of which \$12,000 is for salaries and \$8,000 for traveling and other miscellaneous expenses. The investigations are conducted by a staff of assistant agriculturists, including Messrs. F. G. Allison, J. S. Cates, J. S. Cotton, J. A. Drake, H. B. McClure, C. E. Quinn, and S. M. Tracy, the subjects assigned to each of whom being indicated opposite their names elsewhere in these pages.

SMITH, ERWIN F. Pathologist in charge of Laboratory of Plant Pathology. The work includes the identification of diseased specimens received from correspondents and the suggestion of remedies where known; the study of the life history of various plant parasites and of bacterial and other diseases; and miscellaneous pathological investigations. Diseases of the sugar cane, olive, corn, rice, and other crops are under investigation. The Laboratory is the center of all the pathological investigations of the Bureau, and is therefore the basis of all of the work on plant diseases. Expenses this year, about \$15,000, of which \$9,000 is for salaries and \$6,000 for miscellaneous expenses. Dr. Smith is assisted by Mr. John R. Johnston and Miss Florence Hedges.

SPAULDING, PERLEY. Assistant in forest pathology. See Metcalf.

SPILLMAN, W. J. Agriculturist in charge of Farm Management Investigations. Personally engaged in the investigation of various soil and crop problems, studies of farm practice, etc. The work covers the study of types of farming; methods of crop and stock management; farm equipment; local conditions with

Spillman, W. J.--Continued.

reference to labor and markets; varieties of crops grown; methods of utilizing crops; methods of tillage; and adaptability of types of farming to various regions. The work also includes the making of farm plans and general supervision of the conduct of object-lesson farms and demonstrations in special phases of farming; in the diversification of crops in the cotton belt and on rice lands; and studies of farm practice in the cultivation and utilization of various crops. Much of this work is carried on in cooperation with the State experiment stations. With those of Kentucky and Maryland demand studies are conducted upon the relation of types of farming to soil fertility; and with the Missouri station experiments in the production of forage for beef cattle are being conducted. Expenses this year in the administrative phases of the work, about \$7,500, of which \$6,000 is for salaries and \$1,500 for traveling and other miscellaneous expenses. These figures are exclusive of the investigations of Messrs. Brodie, Griffiths, Peck, and C. B. Smith, and their respective staffs, described elsewhere in these pages, which are directed by Prof. Spillman.

STEWART, J. B. Expert in tobacco investigations. See Shamel.

STOCKBERGER, W. W. Expert, Drug Plant Investigations. Engaged in investigations of American hops. Work is being conducted at points in California, Oregon, Washington, New York, and at Washington, D. C., having for its object the working out of the conditions of growing, curing, and handling hops which are most favorable to the development of

Stockberger, W. W.--Continued.

desirable qualities and constituents. A study of the relation between quality and the conditions mentioned is being made both in the field and in the laboratory. The investigations have shown that the quality can be much improved by better methods of curing and cleaner picking, and improvement in these lines is being encouraged in the hop districts of the Pacific coast, with a view to eliminating the present discrimination against American hops which exists in many markets because of a supposed lack of these desirable qualities in the American product. Expenses this year, about \$2,700, of which \$1,600 is for salary and \$1,100 for traveling and other miscellaneous expenses.

STUBENRAUCH, A. V. Expert in fruit transportation and storage investigations in California. See Powell.

SWINGLE, WALTER T. Physiologist in charge of Plant Life History Investigations. Personally engaged in the investigation of commercial date culture and the life history of the date palm in California, Arizona, and Texas; investigations of the Chinese date as a substitute for dates in the cold regions of the West; a study of the life history of the pistache nut and of wild species of the pistache on which it can be grafted, with a view to the introduction of the culture of this nut in the Southwestern States; an investigation of the application of electricity to plant culture, to determine by field tests whether it can be applied with advantage in truck farming; and various other lines of life history investigations. Expenses this year in these phases of the work, about \$7,500, of which \$4,000 is for salaries

Swingle, Walter T.--Continued.

and \$3,500 for traveling and other miscellaneous expenses. Associated with Mr. Swingle in this work are Messrs. Silas C. Mason and Charles J. Brand, who also conduct other lines of life history investigations (see pages 20 and 48).

TAYLOR, WM. A. Pomologist in charge of fruit marketing investigations, in addition to general supervision of Field Investigations in Pomology. Fruit marketing work is being conducted in Connecticut, New York, Delaware, Virginia, West Virginia, Georgia, Illinois, and Florida. The objects are the improvement of methods of packing and handling fruits, with a view to insuring their delivery to consumers in more attractive, sound, and wholesome condition. Special attention is being given to summer and winter apples, peaches, pomelos, and pineapples, with particular reference to the trans-Atlantic exportation of these fruits. The work is closely allied with and in certain respects dependent on the fruit transportation and storage investigations (see Powell); and the Bureau of Chemistry cooperates in certain features. Cooperative work with individual fruit growers is largely practiced. Expenses this year in fruit marketing work, about \$6,400, of which \$3,400 is for salaries and \$3,000 for traveling and other miscellaneous expenses. Associated with Mr. Taylor in this work is Mr. G. Harold Powell, and they are assisted by Messrs. L. S. Tenny, G. W. Hosford, and H. M. White.

TENNY, L. S. Assistant pomologist in fruit marketing, transportation, and storage investigations in California, Florida, and eastern States generally. See Powell; Taylor.

TIDESTROM, IVAR. Assistant, Taxonomic Investigations. See Wight.

TOURNIER, ALFRED. Special agent in grape investigations. See Husmann.

TOWNSEND, C. O. Pathologist in charge of Sugar Beet Investigations. Work is being conducted in the laboratory, the greenhouse, and the field, the latter being in progress in Utah, Michigan, Iowa, Montana, Idaho, Washington, Colorado, Texas, New Mexico, and Nevada. Cooperation with the experiment stations of Montana and Minnesota, with sugar companies in Utah and Michigan, and with more than one hundred farmers throughout the localities mentioned is under way. The objects of the work are to find practical methods for controlling the diseases of the sugar beet; to produce single-germ beet seed; to improve the yield and quality of the beets; to produce strains resistant to alkali and to drought, as well as early maturing strains; to find the best method of siloing seed beets; to extend sugar beet culture into localities where the soil and climate seem favorable for the development of the industry; and to determine the cultural methods best suited to sugar beet production. The work is redhted in part to certain phases of the investigations of Messrs. Chilcott, Kearney, and Scofield, described elsewhere in these pages. Expenses this year, about \$15,000, of which \$7,000 is for salaries and \$8,000 for traveling and other miscellaneous expenses. Dr. Townsend is assisted by Mr. E. C. Rittue.

TRACY, J. E. W. Assistant, Sugar Beet Investigations. Engaged in investigations of the commercial production of sugar beet seed, and the testing of the comparative merits of

Tracy, J. E. W.--Continued.

American and foreign grown seed. Work is being conducted in Michigan, New York, California, Utah, Oregon, Idaho, Kansas, Wisconsin, Iowa, Montana, Colorado, and Washington, having for its objects the production of high-grade strains of seed, the establishment of the sugar beet seed industry in the United States, and the securing of information as to the true worth of all sugar beet seed planted in the United States. Cooperation is practiced with the experiment stations of New York, Michigan, Utah, Colorado, and Oregon, and also with many factories. The work includes the selection of the best roots grown and the commercial testing of the comparative merits of the seed grown in this country and that grown abroad. The work is closely related to the investigations of Dr. C. O. Townsend, just described. Expenses this year, about \$5,000, of which \$3,200 is for salaries and \$1,800 for traveling and other miscellaneous expenses. Associated with Mr. Tracy in this work is Mr. J. F. Reed.

TRACY, S. M. Special agent, Farm Management Investigations. Studies forage crops for the Gulf coast region. See Smith, C. B.

TRACY, W. W., Jr. Assistant, Vegetable Variety Testing Gardens. See Tracy, W. W., Sr.

TRACY, W. W., Sr. Superintendent, Vegetable Variety Testing Gardens. Field work is being conducted in Maine, New Hampshire, Connecticut, New York, Missouri, Minnesota, Nebraska, Alabama, and at the Plant Introduction Garden, Chico, Cal.; and testing grounds are also maintained near Washington, D. C. Cooperation with the experiment stations of Maine, New Hampshire, Missouri,

Tracy, W. W., Sr.--Continued.

Alabama, and Nebraska, and with seedsmen and private individuals is in effect. The work has for its objects the standardization of American varieties of vegetables and the testing of new types introduced into the seed trade, to ascertain their true worth. Tests are also made of the seed purchased for Congressional distribution. Expenses this year, about \$11,000, of which \$7,500 is for salaries and \$3,500 for traveling and other miscellaneous expenses. Prof. Tracy is assisted by Mr. W. W. Tracy, Jr.

TRUE, RODNEY H. Physiologist in charge of Drug and Poisonous Plant Investigations, and Tea Culture Investigations. Personally engaged in investigating the production of morphine and other alkaloids from the capsules of the Asiatic poppy; the production and utilization of camphor in the United States; the production of denatured alcohol from potatoes, unmarketable fruit, waste products of the farm, etc.; experimental tests of various drug-producing plants, both wild and cultivated forms of foreign and domestic species being under trial; and investigations of the commercial production of tea in the United States. Work on the Asiatic poppy is being conducted in California, Texas, South Carolina, Vermont, and at Washington, D. C., having as its object the utilization of the walls of the poppy capsules as a commercial source of morphine, codeine, and other poppy alkaloids. Camphor investigations in Florida and Texas are concerned with the growing and utilization of camphor trees for the production of gum and oil. The work on denatured alcohol has been only recently inaugurated. Miscellaneous drug plant tests are being conducted in Vermont, South Carolina, Texas, and at Washington.

True, Rodney H.--Continued.

having for their objects the testing in different localities of the behavior of native and imported drug plants, with a view to working out the best methods of their cultivation and handling. In the drug plant work cooperation with the Vermont experiment station is maintained. Expenses this year in these features of the work, about \$10,000, of which \$5,500 is for salaries and \$4,500 for traveling and other miscellaneous expenses. Dr. True is assisted by Messrs. Frank Rabak, G. F. Klugh, T. B. Young, S. C. Hood, and Miss Alice Henkel; and the investigations of Messrs. Crawford, Marsh, and Stockberger, described elsewhere in these pages, are directed by Dr. True.

Tea Culture Investigations are being conducted in South Carolina, Texas, Wisconsin, and at Washington, D. C., with the objects of ascertaining the practicability of growing and manufacturing tea on a profitable commercial basis, and to work out the relation between quality and constituents, with a view to the improvement of processes and product. The work covers field and factory tests in South Carolina and Texas, and laboratory investigations both at Washington and in Wisconsin. Expenses this year, about \$7,000, of which \$3,500 is for salaries and \$3,500 for traveling and other miscellaneous expenses. Dr. True is assisted by Messrs. G. F. Mitchell and F. W. Clarke, and cooperates with Dr. Charles U. Shepard, of Summer-ville, S. C.

TULL, JOHN H. Special agent, Foreign Seed and Plant Introduction. Engaged in experiments having for their object the introduction of the matting rush industry. Agricultural explorations have recently been conducted in Japan for the purpose of studying

Tull, John H.--Continued.

the methods of growing and harvesting the rush there and of obtaining roots of the Japanese rushes for planting in various parts of the United States. Field work in testing both the imported and domestic rushes is being conducted in South Carolina, Texas, Louisiana, and at the Plant Introduction Garden, Chico, Cal. The object of the work is to establish domestic sources of supply for the raw material used in the manufacture of matting, and thereby build up a valuable new industry. Expenses this year, about \$5,000, of which \$1,800 is for salaries and \$3,200 for traveling and other miscellaneous expenses.

TYLER, FRED J. Assistant botanist, Taxonomic Investigations. Engaged in the classification of species and cultivated varieties of cotton. Work is being conducted in South Carolina and Florida, and on the Arlington (Va.) Experimental Farm. The object sought is a satisfactory classification of the species of the genus *Gossypium*, including the cultivated cottons; and a classification and description of the cultivated varieties, with a view to establishing types or standards of varieties. The work covers the growing and study in the field of all kinds of cottons obtainable, noting all characters of differentiation, tabulation and comparison of these notes, and their comparison with all available previous descriptions. The work is closely related to the fiber plant investigations of Mr. L. H. Dewey (see p. 31). Expenses this year, about \$2,200, of which \$1,600 is for salaries and \$600 for traveling and other miscellaneous expenses.

UMBERGER, H. J. C. Assistant, Grain Investigations. See Carleton.

VINALL, H. N. Assistant, Forage Crop Testing and Extension. See Oakley.

WAITE, NERTON B. Pathologist in charge of Investigations of Diseases of Fruits. Personally engaged in the eradication of pear blight, work of this kind being conducted in California, Georgia, Utah, Colorado, and Idaho. Cooperation with the California experiment station is in effect, and with State and county officials in other States. The principal feature of this work is to demonstrate the methods of controlling the blight, which affects chiefly pears and apples, the object being to instruct fruit growers how to eradicate it or bring it under control. The work is the result of careful bacteriological and microscopical investigations of the disease. Work on the eradication of the "little peach" disease is being conducted in Michigan and New York, where this disease is prevalent. The object is to learn its nature and to demonstrate the best method of controlling it in orchards. Cooperation with State officials in both of the States mentioned is in effect. In addition to these investigations considerable attention is given to miscellaneous problems in connection with diseases of orchard fruits, the attempt being to study all diseases of orchards and find remedies for them. Extensive correspondence with fruit growers is carried on for this purpose. Expenses this year, about \$11,000, of which \$6,000 is for salaries and \$5,000 for traveling and other miscellaneous expenses. Mr. Waite is assisted by Messrs. P. J. O'Gara and W. S. Ballard. The investigations of Messrs. W. M. Scott and C. L. Shear, described elsewhere in these pages, are directed by Mr. Waite.

WARBURTON, C. W. Assistant agronomist, Grain Investigations. Engaged in the introduction and adaptation of oat varieties. Work is being conducted in all of the principal oat States, particularly in the North Central States and the winter oat districts, the object being to improve the methods of cultivation, special attention being given to the development of hardier winter varieties. The work also includes the introduction of new varieties into regions where they are believed to be especially adapted to the local conditions of soil and climate. Expenses this year, about \$2,500, of which \$1,600 is for salary and \$900 for traveling and other miscellaneous expenses.

WARREN, J. A. Assistant agriculturist, Farm Management Investigations, District No. 7, including Oklahoma, Kansas, and Nebraska. See Brodie.

WESTGATE, J. M. Assistant agrostologist, Forage Crop Testing and Extension. Engaged in the introduction and extension of alfalfa. Work in the extension of alfalfa growing is being conducted in Michigan, Ohio, New York, North Carolina, Maryland, and the Eastern States generally, close cooperation being maintained with the experiment stations of all the States named except New York, and also with the Connecticut station. Work in the introduction of new varieties is being carried on throughout the West, especially in the arid parts of the Great Plains Area with Turkestan alfalfa, and in California and the Southwest with Arabian alfalfa. Work is being conducted especially in Kansas, Nebraska, Arizona, New Mexico, Colorado, Oregon, and Texas. This work is closely related to the life history and breeding work on alfalfa conducted by Messrs. Brand and Kearney (see

Westgate, J. M.--Continued.

pp. 20 and 41). The work in the East has for its object to determine whether alfalfa is a more satisfactory crop than red clover or other legumes and, if so, the best methods of securing a stand and handling the crop. In the West the object is the introduction of drought resistant strains in the dry regions and heavier yielding crops in the irrigated regions. Expenses this year, about \$6,000, of which \$2,700 is for salaries and \$3,300 for traveling and other miscellaneous expenses. Mr. Westgate is assisted by Mr. Nickolas Schmitz.

WHEELER, C. F. Expert, Taxonomic Investigations. See Wight.

WHITE, H. M. Assistant, Field Investigations in Pomology. See Powell; Taylor.

WIGHT, W. F. Assistant botanist, Taxonomic Investigations. In charge of the Economic Collections. The work is mainly performed at Washington, D. C., in cooperation with various other branches of the Bureau, supplemented by field work. The objects are the preservation in permanent form of specimens of all introduced plants, and of other economic plants under investigation by the Bureau; the formation of a collection of cultivated plants as the basis of an accurate knowledge of these plants; and the collection of data regarding the hardiness of the various species and varieties. The work covers the critical study and identification of all the material in the collection. Expenses this year, about \$9,000, of which \$7,000 is for salaries and \$2,000 for traveling and other miscellaneous expenses. Mr. Wight is assisted by Messrs. C. F. Wheeler and Ivar Tidestrom.

YOUNG, T. B. Assistant, Drug Plant Investigations. See True.

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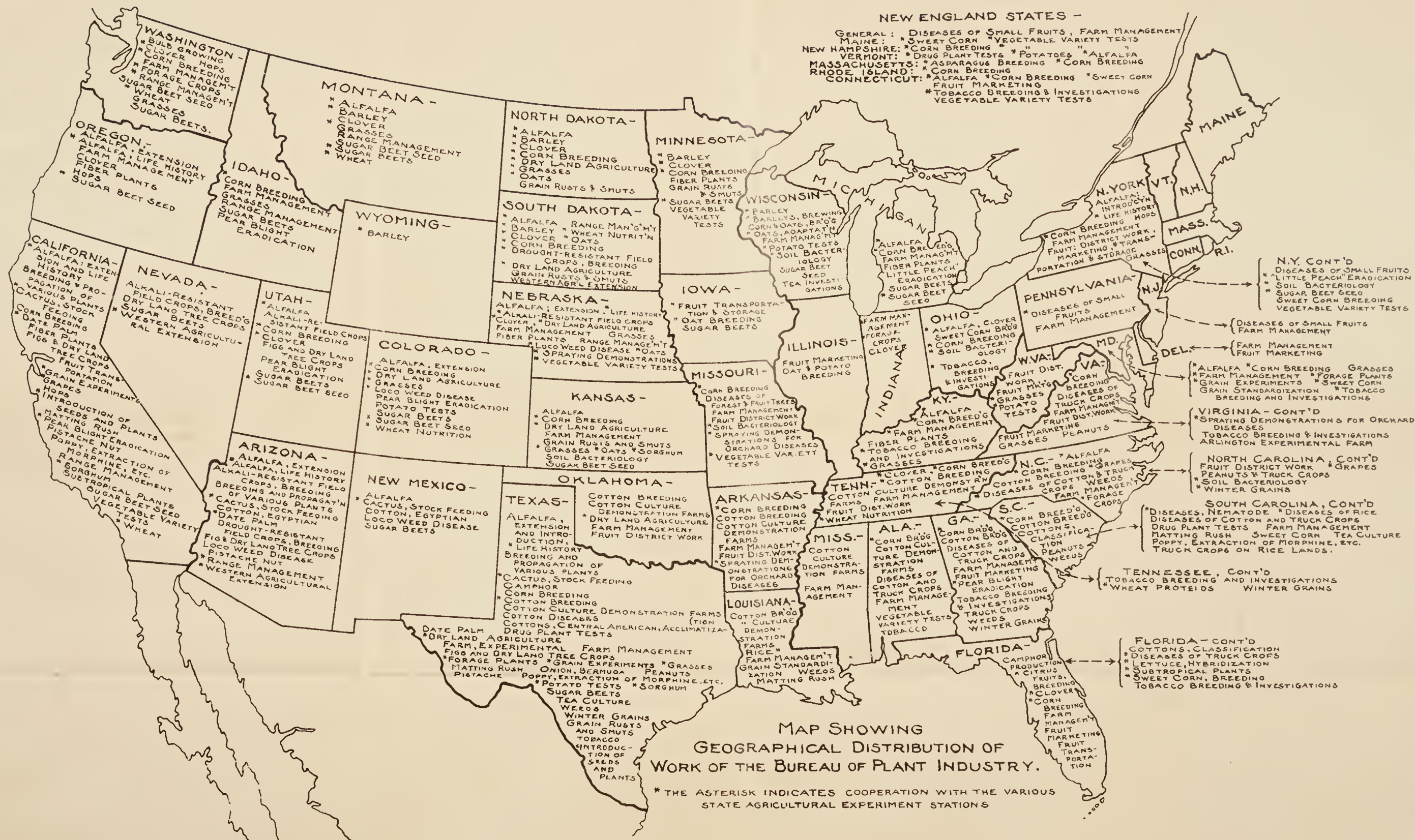
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A P P E N D I X

PUBLICATIONS OF THE BUREAU OF PLANT INDUSTRY

The publications of the Bureau of Plant Industry, which embody the results of its various investigations, consist of three principal classes, viz: (1) a series of Bureau Bulletins, which are of a scientific or technical nature; (2) contributions to the Department series of Farmers' Bulletins, which are written in practical or popular form; and (3) articles contributed to the Yearbooks of the Department, bearing on plant subjects of timely popular interest.

Bureau Bulletins

The first-named class of publications is not available for general distribution, the numbers in this series being issued in very limited editions to meet the requirements at the time of their issue. A list of these publications follows. Where the asterisk occurs the Department's edition of the Bulletin is exhausted. Where a price is indicated in the right-hand column the Bulletin may be obtained from the Superintendent of Documents, Government Printing Office, Washington, D. C., by remitting the nominal amount mentioned by money order or in cash.

Year	No.		Price Cts.
1901	*1	The Relation of Lime and Magnesia to Plant Growth	10
	*2	Spermatogenesis and Fecundation of Zamia	20
	3	Macaroni Wheats	20
1902	4	Range Improvement in Arizona . .	10
	*5	Seeds and Plants Imported.	
	6	American Varieties of Peppers . .	10
	*7	The Algerian Durum Wheats	15
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	*12	Stock Ranges of Northwestern Cali- fornia	15
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	22	Injurious Effects of Premature Pollination	10
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	27	Letters on Agriculture in the West Indies, Spain, and the Orient .	15
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	*38	Forage Conditions and Problems in Eastern Washington, etc.	15
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	*42	New Plant Introductions from Japan	10
	43	Japanese Bamboos	10
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	45	The Physiological Rôle of Mineral Nutrients in Plants	5
	*46	Propagation of Tropical Fruit Trees and Other Plants	10
	*47	Description of Wheat Varieties	10
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	*53	The Date Palm	20
	54	Persian Gulf Dates	10
	55	The Dry Rot of Potatoes	10
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	76 Copper as an Algicide and Disin- fectant in Water Supplies . . .	5
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	82 Grass Lands of the South Alaska Coast	10
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	*89	Wild Medicinal Plants of the United States	5
	90	Miscellaneous Papers (four parts)	5
	91	Varieties of Tobacco Seed Distrib- uted, with Cultural Directions	5
	*92	Date Varieties and Date Culture in Tunis	25
	*93	The Control of Apple Bitter-Rot .	10
	*94	Farm Practice with Forage Crops in Western Oregon, etc.	10
	95	A New Type of Red Clover	10
1907	96	Tobacco Breeding	15
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	98	Soy Bean Varieties	15
	99	A Quick Method for the Determina- tion of Moisture in Grain	5
	100	Miscellaneous Papers (eight parts)	25
	101	Index to Bulletins Nos. 1-100. (In preparation.)	
	102	Miscellaneous Papers (eight parts) Each part	5
	103	Dry Farming in the Great Basin . .	In press (May 25, 1907)
	104	The Use of Feldspathic Rocks as Fertilizers	
	105	Relation of Composition of Leaf to Burning Qualities of Tobacco .	
	106	Seeds and Plants Imported	
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	108	The Cold Storage of Small Fruits .	
	109	American Varieties of Garden Beans	
	110	Cranberry Diseases	
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Farmers' Bulletins

The Department series of Farmers' Bulletins is the main channel through which the results of its work in compact written form are placed within the reach of farmers throughout the country. These bulletins are for free distribution to citizens of the United States. A list of the available numbers, as well as a brief subject index, may be obtained upon application to the Chief of the Division of Publications of this Department. An up-to-date list of these publications is also contained at the end of nearly every new bulletin issued. The Bureau of Plant Industry contributes about 15 numbers annually to the Farmers' Bulletin series.

Yearbook Papers

The Yearbook papers are reprinted in separate form for limited free distribution. A list of those articles which are available may be found in Circular 3 of the Division of Publications.

Miscellaneous

In addition to its three principal series of publications, the Bureau issues from time to time various miscellaneous documents, such as the annual report of the Chief of the Bureau and brief circulars on various subjects. The annual reports, which contain a résumé of the scientific investigations of the Bureau, are available for distribution as long as their editions last.

LOCATION OF THE OFFICES OF THE BUREAU OF PLANT INDUSTRY IN WASHINGTON, D. C.

Pending the completion of the new building for the Department of Agriculture, the Bureau of Plant Industry, like many other branches of the Department, is quartered almost entirely in rented buildings. As the offices of the Bureau are necessarily scattered, the following guide to their location may be of service.

<u>Office or Laboratory</u>	<u>Head</u>	<u>Location*</u>
Chief of Bureau	B.T.Galloway	West of main building
Assistant Chief of Bureau	A.F.Woods	1306 B St.
Plant Pathology	E.F.Smith	1306 B St.
Diseases of Fruits	M.B.Waite	1306 B St.
Forest Pathology	Haven Metcalf	1306 B St.
Plant Life History	W.T.Swingle	201 13 St.
Cotton and Tobacco Breeding	A.D.Shamel	1308 B St.
Corn Breeding	C.P.Hartley	1308 B St.
Alkali, etc., Plant Breeding	T.H.Kearney	1308 B St.
Soil Bacteriology	K.F.Kellerman	1306 B St.
Bionomic Investigations	O.F.Cook	224 12 St.
Drug Plant) Investi- Poisonous Plant)ti- Tea Culture)gations)	R.H.True	224 12 St.
Physical Laboratory	L.J.Briggs	237 14 St.

*All street addresses Southwest

<u>Office or Laboratory</u>	<u>Head</u>	<u>Location*</u>
Crop Technology	N. A. Cobb	1226 B St.
Taxonomic Investi- gations	F.V.Coville	224 12 St.
Farm Management	W.J.Spillman	1316 B St.
Grain Investiga- tions	M.A.Carleton	1306 B St.
Grain Standardiza- tion	J.D.Shanahan	1226 B St.
Horticulturist	L.C.Corbett	Seed Sec- tion**
Sugar Beet Inves- tigations	C.O.Townsend	1306 B St.
Western Agricul- tural Extension	C.S.Scofield	224 12 St.
Dry Land Agricul- ture	E.C.Chilcott	1224 B St.
Pomological Coll lections	G.E.Brackett	203 13 St.
Field Investiga- tions in Pomology	(W.A.Taylor) (G.H.Powell)	205 13 St.
Superintendent Gardens & Grounds	E.M.Byrnes	NW. corner Dept. grounds
Foreign Seed and Plant Introduction	David Fairchild	Seed Sec- tion**
Forage Crop Test- ing and Extension	C.V.Piper	Seed Sec- tion**
Supt. Vegetable Testing Gardens	W.W.Tracy, Sr.	Seed Sec- tion**
Seed Laboratory	Edgar Brown	224 12 St.

*All street addresses Southwest

**The "Seed Section" is located within
the Department grounds, at the north-
east corner of Fourteenth and B Sts.
Southwest

